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MRS. GEORGE E. NICHOLS
439 EDGEWOOD AVENUE
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My dear Bill,

Mr. La Rue has sent duplicate copies of the inventory of George's things, one of which I have sent to Arnold to check. Just now I have been over to Aetna Lab. and Mr. Castle says that almost everything is in duplicate here. I wish you would choose some book or publication that you would like for your own personal ownership - or maybe two or three - I know George would like

to have you have them. If they are just away and you have not time to think about it, perhaps you can choose next year. I cannot dispose of the library as a whole anyway, until some red-tape is untied.

Your year in Porto Rico sounds exciting, and I hope the family will flourish there. I shall not expect to hear from you until you get there.

My main business was to say that Dr. Evans owns any hand to find, he goes either to you, yourself, or Jack or Margaret would be

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fully qualified to write the biography of the Biologist. Harold Lutz just published one in the American Journal of Science, and of course Yale is getting one ready for their record. I think all details are correct in Harold's account, but will be glad to help with any questions that may come, for the one who is chosen to write it. I just received a most appreciative letter from Jack, and Margaret stopped in not long ago. Please use your own judgement. Of course you would be my first choice.

I can imagine the closing hours at the Station, and the hectic time you'll be having to get off. But it will be lovely on the ship, and also when you get there.

My love to the family,

Cordially yours -

Grace Walker Nichols

How about Pesquereau's + James "Moores of North America"

Do you have it?

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NEW HAVEN, CONN.

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MANUAL

OF THE

MOSSES OF NORTH AMERICA.

BY

LEO LESQUEREUX AND THOMAS P. JAMES.

WITH SIX PLATES

ILLUSTRATING THE GENERA.

Boston:
BRADLEE WHIDDEN.
1895.

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PREFACE.

In 1848 William S. Sullivant published, in the first edition of Gray's Manual of Botany, descriptions of two hundred and five species of Mosses and sixty-six of Hepaticæ. In the second edition of the same Manual, published in 1856, four hundred and ten species of Mosses and one hundred and seven of Hepaticæ were described by him, with the addition of eight fine plates for the illustration of the more important genera.* This second edition becoming soon exhausted, Mr. Sullivant, urged by the friends of American botany to publish, in a separate volume, a Manual of American Mosses, decided to begin the preparation of such a work in connection with the present writer, who had been since 1848 his constant assistant in bryological research. A large amount of material had been collected, the new mosses continually received had been examined and described, and much preparatory labor had thus been done when, in 1872, my sight partially failed me, and a few months later Sullivant's noble career was closed by death.

The bryological collections of Sullivant, together with his library and his manuscript notes, had been bequeathed to the Harvard University Herabrium, and at the suggestion of Prof.

* Separate issues of both of these editions were made under the title of "Musci and Hepaticæ of the Northern United States," the last of which reprints (containing some additions) is the work cited throughout the following pages as "Sullivant's Mosses of the United States."

Gray, who ardently desired that these valuable materials should be used in continuation of the plan begun by the donor, it was arranged that I should undertake the work in connection with Mr. Thomas P. James, of Cambridge, who would make the microscopical analyses of such species as had not yet been satisfactorily examined, and prepare sketches from which descriptions could be drawn.

As large numbers of specimens and even whole collections were sent to us for determination, the work progressed slowly, but it was drawing toward completion when two years ago Mr. James was suddenly called away by death.

I have since finished the descriptive part of the work, with assistance from Mr. T. Renauld, an eminent French bryologist, in the examination of some *Hypneæ* that had not been surely determined.

But I was prevented by age and sickness from visiting Cambridge in order to complete at the library of the Herbarium the bibliographical part of the work, which could not be done with the few books at my disposal. In the emergency, having greatly admired the manner in which Mr. Sereno Watson — not a professed bryologist — had elaborated the Mosses of the Botany of California, I besought his assistance, little comprehending at the time the weight which I was imposing upon one whose time and energies were already overtasked. This labor of revisal, and the charge of the work in its progress through the press, Mr. Watson at length consented to undertake, especially through regard to the memory of his friend, my associate, Mr. James. It has involved a large amount of critical and editorial labor, and I deeply regret that I am permitted to do no more than to acknowledge, as I gratefully do, my profound obligations to him. But I may bespeak the thanks of all those who are to use this volume, which he has made much more valuable and better adapted to their needs than it would otherwise have been.

This Manual of American Mosses is believed to include descriptions of all the species of mosses (about nine hundred) that are as yet known to occur on the North American Continent within the limits of the United States and northward. It includes the results of the researches of Sullivant and myself, continued until 1872, as well as those of James, Austin, and Rau, and also such species as have been described by European bryologists, Schimper, Mitten, Mueller, Hampe, Lindberg, etc.

LEO LESQUEREUX.

COLUMBUS, OHIO, May, 1884.

MANUAL

OF THE

MOSSES OF NORTH AMERICA.

ARTIFICIAL ANALYSIS

OF THE

GENERA OF MOSSES.

I. ACROCARPI. Fruit terminal.

A. Capsule without a deciduous operculum.

* Capsule dehiscing by irregular transverse rupture. Plants very small.

+- Leaves nerveless. Prothallium persistent.

1. **Micromitrium.** Capsule globose, nearly sessile. Calyptra minute, closely adhering.
2. **Ephemerum.** Capsule globose-ovate. Calyptra campanulate. Leaves nerveless, except in one species.

+- +- Leaves with a distinct medial nerve. Prothallium none.

3. **Physcomitrella.** Caulescent. Capsule globose, apiculate. Calyptra campanulate.
7. **Microbryum.** Stemless. Calyptra reaching the middle of the capsule, plurilobate at base, splitting on one side. Leaves more closely areolate, minutely papillose on the back.
4. **Sphærangium.** Stemless. Capsule small, spherical, enclosed in a cluster of imbricate very concave or carinate leaves.
5. **Phascum.** Caulescent. Capsule pedicellate. Calyptra cucullate.
6. **Pleuridium.** Plants larger, caulescent, ramose. Capsule ovate. Calyptra cucullate. Leaves narrower, lanceolate-subulate.
8. **Bruchia.** Capsule apophysate, except in one species. Calyptra mitriform, lobate or irregularly lacerate at base.
9. **Archidium.** Capsule globose, sessile. Calyptra irregularly torn, adhering. Spores remarkably large and few.

* * Capsule dehiscing by four longitudinal slits.

Andreæa. Capsule sessile on a pedicellate vaginule. Plants brittle and rigid when dry. See Order II. *Andreæaceæ.*

B. Capsule dehiscing by a deciduous operculum.

* Mouth of the capsule naked.

+- Capsule sessile on a pedicellate vaginule.

Sphagnum. Calyptra irregularly torn, persistent. Plants soft, flaccid. See Order I. *Sphagnaceæ.*

+ + Capsule on a proper pedicel. Vaginule sessile.

10. **Astomum.** Plants small. Operculum not easily detached. Calyptra cucullate. Flowers monœcious.

11. **Gymnostomum.** Plants larger. Operculum long-beaked. Calyptra cucullate. Flowers dicœcious.

12. **Ancectangium.** Plants cespitose. Stems dichotomous, as in *Pleurocarpi*.

33. **Anodus.** Plants very short. Capsule small, obovate, long-pedicellate. Calyptra cucullate. Flowers monœcious, without paraphyses.

38. **Pharomitrium.** Capsule immersed, globose. Calyptra oblique, plurilobate. Leaves with a long white awn.

39. **Pottia.** Capsule small, with a broad orifice. Calyptra cucullate. Leaves with a loose hyaline basilar areolation.

48. **Hedwigia.** Capsule obovate, immersed. Calyptra mitriform. Leaves hyaline, ciliate at the apex.

49. **Pseudobraunia.** Capsule long-pedicellate, pyriform. Calyptra narrow, cucullate.

31. **Amphoridium.** Capsule striate, urceolate. Calyptra cucullate.

59. **Encalypta** (1st Section). Capsule oblong-cylindrical. Calyptra very long, cylindrical-campanulate.

60. **Calymperes.** Calyptra twisted, persistent, plicate, constricted at base.

65. **Schistostega.** Plants small, delicate, frondiform. Capsule small, globular, pedicellate. Calyptra mitriform.

70. **Pyramidula.** Calyptra large, tetragonal, enclosing the capsule and dehiscent by lateral slits.

71. **Aphanorhegma.** Capsule globose, nearly sessile, splitting transversely in the middle at maturity.

72. **Physcomitrium.** Capsule pedicellate, globose or turbinate. Calyptra five-lobate, with a long terete straight beak.

* * Mouth of the capsule furnished with teeth (peristome).

+ Peristome single.

++ Teeth of the peristome 4.

62. **Tetraphis.** Capsule long-pedicellate, linear. Calyptra mitriform. Stems conspicuous.

63. **Tetrodontium.** Capsule ovate. Calyptra large, mitriform. Plants small, nearly stemless.

++ ++ Teeth of the peristome 8.

28. **Octoblepharum.** Capsule ovate, pedicellate. Leaves thick, membranaceous, of two or more layers of cells.

++ ++ ++ Teeth of the peristome 16. Calyptra mitriform.

= Calyptra plicate.

50. **Coscinodon.** Teeth cribrose. Operculum very large.

51. **Ptychomitrium.** Teeth narrowly linear, deeply bifid to near the base.

52. **Glyphomitrium.** Teeth entire. Calyptra large, covering the capsule to below the base, plicate and cleft at base.

56. **Orthotrichum** (1st Section). Capsule emerging. Calyptra hairy, campanulate-mitrate. Leaves short, striate when dry.

55. **Ulota** (2 species). Capsule longer-pedicellate, defluent into a long collum. Calyptra yellow, hairy, split at base.

= = Calyptra not plicate.

36. **Brachyodus.** Plants very small. Teeth hyaline-punctulate, more or less perforate. Calyptra 5-lobed at base, split on one side to near the apex.

37. **Campylosteleum.** Capsule thin, on a long slender geniculate pedicel. Teeth cleft to the middle or lower. Calyptra long-subulate.

26. **Conomitrium.** Calyptra short-conical, solid. Teeth entire or laciniate at the apex. Plants floating.

45. **Cinclidotus.** Calyptra split at base on one side. Teeth cancellate, multifid, membranous.

46. **Grimmia.** Teeth lanceolate, entire, cribrose or 2–3-cleft at the apex. Capsule oval, short-pedicellate. Leaves smooth, generally hair-pointed.

47. **Racomitrium.** Plants of large size. Calyptra subulate. Teeth 2–3-cleft into filiform segments.

66. **Dissodon.** Calyptra large, constricted at base. Teeth short or truncate, bigeminate.

67. **Tayloria.** Teeth long, loricate, entire or bifid, attached below the orifice.

69. **Splachnum.** Capsule with large apophysis. Teeth bigeminate. Calyptra small, conical, entire.

↔ ↔ ↔ ↔ Teeth of the peristome 16. Calyptra cuculliform.

= Leaves two-ranked.

25. **Fissidens.** Leaves frondiform. Teeth articulate, cleft to the middle into two unequal segments.

31. **Distichium.** Leaves subulate. Teeth linear, nearly entire, or bifid, or lacerate.

32. **Eustichia.** Leaves imbricate, carinate-compressed, with long flexuous points. Fruit unknown.

= = Leaves spreading every way.

a. Capsule cernuous-inclined, unequal.

15. **Oreoweisia.** Teeth abruptly lanceolate-subulate from an enlarged base ; articulations prominent. Leaves serrulate.

17. **Cynodontium.** Capsule short-ovate; collum distinct, regular or strumose. Segments of the teeth unequal. Leaves serrulate at apex.

18. **Dichodontium.** Capsule solid; collum short. Teeth large, bifid or trifid to below the middle. Leaves sheathing at base.

19. **Trematodon.** Capsule long-pedicellate, narrowed into a long apophysis. Teeth nearly entire or irregularly bifid to the base.

21. **Dicranella.** Plants small. Leaves smooth, squarrose or secund. Teeth as in *Dicranum*.

22. **Dicranum.** Plants large. Teeth regularly bifid to the middle, closely articulate. Areolation linear at the base, quadrate and inflated at the angles.

27. **Leucobryum.** Plants soft, yellowish, spongy. Leaves without costa. Teeth as in *Dicranum*.

29. **Ceratodon.** Capsule ovate-oblong, with a short struma. Teeth bifid to near the base; segments narrowly linear, distinctly articulate.

30. **Trichodon.** Capsule narrowly cylindrical, arcuate. Segments of the teeth strongly nodose at the articulations.

78. **Catoscopium.** Capsule very small, globose, incurved at the collum. Teeth short, irregular. Calyptra very narrow.

76. **Conostomum.** Teeth connivent into a cone. Capsule ribbed.

b. Capsule more regular, slightly curved, somewhat pendulous on an arcuate pedicel.

24. **Campylopus.** Teeth bifid to the middle. Calyptra fringed at the base.

23. **Dicranodontium.** Teeth bifid to the base; segments narrow, linear. Calyptra not fringed.

c. Capsule erect, oval or somewhat pyriform.

13. **Weisia.** Teeth lanceolate, entire, truncate or dentate at the apex. Capsule oval, smooth.

14. **Dicranoweisia.** Teeth longer, lanceolate, distinctly articulate. Plants large. Leaves arcuate or crispate.

16. **Rhabdoweisia.** Teeth linear-subulate, enlarged at the base. Capsule striate.

20. **Angstrœmia.** Teeth large, bifid to the middle. Capsule minute, subglobose, very long pedicellate. Male flowers discoid.

34. **Seligeria.** Teeth broad, lanceolate, obtuse, densely articulate. Capsule pyriform. Plants very small.

35. **Blindia.** Teeth entire, lanceolate, acute, perforated or bifid at the apex. Capsule inflated at the collum, obovate or pyriform. Plants of medium size.

54. **Drummondia.** Teeth very short, truncate. Capsule globose-oval.

64. **Discelium.** Teeth lanceolate, distantly articulate, cleft between the articulations. Calyptra split its whole length, remaining attached to the pedicel.

73. **Entosthodon.** Teeth distantly and strongly articulate, attached below the orifice of the pyriform capsule.

82. **Mielichhoferia.** Capsule pyriform with a long collum, inclined or pendulous. Teeth narrow from an enlarged base, strongly articulate. Calyptra very small, fugacious.

d. Capsule erect, oblong or apophysate.

61. **Syrrhopodon.** Teeth entire, horizontal. Operculum subulate-rostrate.

68. **Tetraplodon.** Teeth short, connate by fours at base. Capsule with a long thick apophysis.

↔ ↔ ↔ ↔ ↔ Teeth of the peristome 32.

= Teeth more or less connate their whole length.

40. **Didymodon.** Teeth flat, narrow, linear-lanceolate, confluent at base, distantly articulate, rarely entire (16), generally split their whole length (32).

43. **Desmatodon.** Teeth entire (16) or cleft to the base (32); segments papillose, tetragonal-terete, either free or connate by transverse partitions; basilar membrane protruding from the orifice.

= = Teeth free.

42. **Trichostomum.** Teeth united in pairs to a narrow basilar membrane; segments equal, filiform, more or less fragmentary.

41. **Leptotrichum.** Peristome as in the last; teeth longer, more regular. Leaves long-subulate, glossy.

44. **Barbula.** Teeth very long, from a more or less broad tessellate marginal membrane, twisted around the columella.

= = = Teeth large, adhering by their points to the tympaniform top of the columella.

93. **Atrichum.** Calyptra spinulose at the apex, cucullate.

94. **Oligotrichum.** Calyptra large, covered with scattered hairs.

95. **Psilopilum.** Teeth long and slender, some of them bipartite. Calyptra narrow, solid, smooth.

96. **Pogonatum.** Calyptra densely hairy, covering the capsule, mitrate.

↔ ↔ ↔ ↔ ↔ ↔ Teeth of the peristome 64.

97. **Polytrichum.** Teeth adhering to the membrane, as in the last section. Calyptra densely hairy.

+– +– Peristome double: its teeth 16.

↔ Capsule symmetrical, erect. Inner peristome of 8 or 16 cilia.

57. **Macromitrium.** Teeth lanceolate; inner membrane cleft or truncate. Calyptra campanulate, plicate.

58. **Schlotheimia.** Teeth revolute, fleshy; inner peristome rudimentary from a colored membrane. Calyptra campanulate, not plicate.

59. **Encalypta** (3d Section). Teeth filiform; cilia similar to the teeth. Calyptra very long, cylindrical or campanulate, not plicate.

56. **Orthotrichum** (2d Section). Teeth 8, bigeminate, or 16, geminate; cilia filiform. Calyptra campanulate-mitrate, plicate, smooth or hairy.

55. **Ulota.** Peristome as in *Orthotrichum.* Calyptra yellow, hairy, deeply split at the base, obscurely plicate.

↔ ↔ Capsule unsymmetrical, inclined to one side, oblique or pendulous.

= Inner peristome a plaited cone.

98. **Diphyscium.** Capsule gibbous, ovate, sessile. Plants small, nearly stemless.

99. **Buxbaumia.** Capsule gibbous-ovate on one side, flat to convex on the other, short-pedicellate.

= = Inner peristome a membrane cut into 16 segments; these sometimes separated by cilia. Calyptra cucullate.

74. **Funaria.** Capsule short-pyriform, curved in the upper part. Teeth obliquely curved; segments of the membrane entire or rudimentary.

83. **Leptobryum.** Capsule pyriform, erect or pendulous. Segments of the membrane separated by two appendiculate cilia. Leaves narrowly lanceolate.

84. **Webera.** Capsule long-pedicellate, cernuous or horizontal: cilia none, rudimentary or perfect, not appendiculate. Leaves lanceolate, glossy; areolation narrowly rhomboidal; costa slender.

85. **Bryum.** Capsule solid, pyriform. Inner peristome more perfect. Leaves broader, with broader areolation and strong costa.

86. **Zieria.** Capsule with a long collum defluent into a short geniculate pedicel. Teeth remotely articulate; segments narrow; cilia rudimentary. Leaves soft, greenish.

87. **Mnium.** Capsule oblong, horizontal or pendulous. Peristome as in *Bryum*, larger. Male flowers discoid. Leaves large, with a very broad areolation.

88. **Cynclidium.** Teeth short, adhering to the longer cupuliform reticulate membrane, which is pierced at the top by the columella.

89. **Rhizogonium.** Capsule long, obconical, arcuate. Peristome of *Bryum*. Leaves solid, long, narrowly lanceolate.

90. **Leptotheca.** Capsule erect, cylindrical. Teeth long, linear-lanceolate. Inner membrane short and entire, or longer and cut into segments without cilia.

79. **Amblyodon.** Teeth shorter than the segments, obtuse. Capsule cernuous, with a long collum. Leaves very loosely areolate.

80. **Meesia.** Capsule and peristome as in the last. Areolation of the leaves small, rectangular.

81. **Paludella.** Peristome of *Webera*. Leaves squarrose.

91. **Aulacomnium.** Capsule inclined, oblong-ovate with a distinct collum, ribbed when dry. Teeth linear-subulate above.

75. **Bartramia.** Capsule nearly spherical, erect or inclined, ribbed when dry. Peristome double (simple in one species, rudimentary in another); segments shorter than the teeth, split into two diverging parts; cilia none or scarcely visible.

77. **Philonotis.** Capsule globose, inclined. Segments separated by double cilia. Plants stronger.

92. **Timmia.** Capsule oblong-ovate, plicate-striate when dry. Inner membrane divided at the middle into filiform appendiculate segments, united by fours at the apex.

II. CLADOCARPI. Fruit terminal on short lateral branches. Peristome double, the outer of 16 teeth.

100. **Fontinalis.** Teeth linear; inner peristome of 16 cilia, connected by cross-bars or latticed. Calyptra conical, entire or cucullate.

101. **Dichelyma.** Cilia of the inner peristome free or appendiculate, latticed only at the upper part. Calyptra cucullate. Leaves long and narrow.

102. **Cryphæa.** Teeth long; inner peristome of 16 free subulate cilia, shorter than the teeth.

III. PLEUROCARPI. Fruit lateral upon the stems or branches; flowers in the axils of the leaves.

* Calyptra cuculliform. Capsule ovate-oblong or cylindrical, erect or slightly inclined.

+ Peristome simple; teeth 16.

114. **Fabronia.** Teeth regular or bigeminate (absent in one species). Plants very small and delicate. Leaves ciliate on the borders, rarely entire.

116. **Habrodon.** Teeth linear-lanceolate, attached far below the orifice of the capsule. Plants very small. Leaves squarrose.

117. **Clasmatcdon.** Teeth irregular, twice or thrice divided to the base. Capsule constricted under the orifice. Plants very small.

← ← Peristome double, the outer of 16 teeth, the inner of 16 segments, with or without cilia.

↔ Leaves papillose.

118. **Thelia.** Teeth linear-lanceolate, subulate; segments shorter than the teeth; cilia rudimentary.

119. **Myurella.** Peristome perfect; cilia 1 or 2, thick, shorter than the segments.

120. **Leskea.** Teeth narrowly lanceolate; segments narrow, linear; cilia none. Capsule oblong, erect or somewhat arcuate.

121. **Anomodon.** Teeth pale, linear-lanceolate; segments very short; cilia none. Capsule oblong or cylindrical. Plants large.

↔ ↔ Leaves not papillose, complanate.

105. **Neckera.** Teeth long, linear-lanceolate; segments short, filiform. Leaves more or less undulate.

106. **Homalia.** Segments longer than the teeth; cilia single, short. Leaves distichous.

125. **Cylindrothecium.** Teeth attached far below the orifice of the capsule; segments narrow, carinate (abortive in one species). Leaves smooth.

↔ ↔ ↔ Leaves not papillose nor complanate.

= Inner peristome a membrane adhering to the teeth.

108. **Leucodon.** Teeth large, thin, granulose, distantly articulate. Perichætium very long. Calyptra smooth.

103. **Leptodon.** Teeth distantly articulate, hyaline-bordered. Perichætium very long. Calyptra hairy.

123. **Pylaisia.** Teeth densely articulate; segments long, partly adhering to the teeth. Calyptra smooth.

= = Inner peristome free, divided to near the base into 16 segments.

104. **Alsia.** Teeth and carinate segments long, linear-lanceolate, with or without cilia. Calyptra smooth. Secondary stems dendroid.

107. **Meteorium.** Teeth and carinate segments short. Capsule small, oval. Plants long, slender, pendulous.

109. **Pterigynandrum.** Teeth short, distantly articulate; segments very short; cilia none. Calyptra smooth. Leaves slightly papillose on the back.

110. **Pterogonium.** Teeth long and closely articulate; segments very short. Calyptra sparingly hairy.

111. **Antitrichia.** Teeth narrowly lanceolate, subulate; segments linear, a little shorter than the teeth. Perichætium long.

126. **Climacium.** Teeth confluent above the orifice of the capsule; segments as long as the teeth, cleft along the keel. Calyptra long, slender, embracing the base of the capsule. Ramification dendroid.

115. **Anacamptodon.** Teeth lanceolate, reflexed when dry; segments filiform, like the cilia in *Orthotrichum*.

122. **Platygyrium.** Teeth free to below the orifice of the capsule, broadly margined; segments narrow, linear, as long as the teeth. Calyptra long, dimidiate, twisted around the capsule.

124. **Homalothecium.** Teeth closely articulate, hyaline-bordered; segments free, short, linear-lanceolate, or longer and adhering to the teeth. Calyptra hairy. Capsule slightly cernuous or erect.

127. **Orthothecium.** Capsule erect or subinclined. Teeth hyaline on the margin; segments linear, as long as the teeth; cilia short or none. Leaves not costate.

= = Inner peristome divided nearly to the middle into 16 segments; cilia 2 or 3.

128. **Hypnum.** Capsule cernuous, arcuate or horizontal, rarely erect. Peristome perfect; cilia articulate or appendiculate.

* * Calyptra mitriform. Capsule exserted, horizontally inclined.

112. **Hookeria.** Teeth lanceolate; segments linear-lanceolate; cilia none. Leaves bicostate. Plants small.

113. **Pterigophyllum.** Peristome as in the last. Plants large. Leaves large, entire, ecostate; areolation very loose.

MANUAL

OF

NORTH AMERICAN MOSSES.

Order I. SPHAGNACEÆ. Peat Mosses.

Soft and flaccid caulescent Mosses, generally of large size, growing in more or less compact tufts or patches on the surface of bogs, or floating in stagnant water, more rarely on the borders of mountain rivulets, whitish, yellowish, sometimes red or olive-colored, perennial by the annual prolongation of the stems or by simple innovations at the apex. Stems mostly undivided and bearing copious lateral branches, composed of a triple cellular tissue, the outer (*cortex*) of large loose cells, the intermediate woody, the central parenchymatose or medullary. Branches partly spreading, partly deflexed and appressed to the stem, in lateral fascicles of 2 to 7, rarely more, those at the summit of the stem capitate, the fascicles gradually more distant downward. Leaves nerveless, translucent, formed of a single layer of two kinds of cells; 1st, large colorless and hyaline ones (*utricles*), generally perforated by pores and lined with spiral or circular filaments (*fibrils*), hence fibrillose and porose; 2d, smaller chlorophyllose ones (*ducts*), narrowly linear, continuous, forming a net of rhomboidal or hexagonal meshes around the utricles: stem-leaves distant, obliquely inserted, erect or deflexed, flat or concave, ovate, obovate, or linguiform, generally obtuse, loosely areolate, their utricles often destitute of fibrils and of pores; branch-leaves smaller, imbricated and

5-ranked, round, ovate, or lanceolate, very concave or even convolute. Inflorescence monœcious or diœcious. Male flowers (*antheridia*) borne upon clavate and catkin-like generally colored branches, solitary at the side of each leaf, globose or ovoid, pedicellate. Female flowers (*archegonia*) generally 3 or 4, at first sessile in a bud-like involucre terminating a short branch, one only perfecting fruit and forming a capsule, which is at length raised upon a kind of pedicel (*pseudopodium*), formed by the gradual elongation of the base (*vaginule*) and covered by large perichætial leaves. Capsule globose, operculate with a convex or nearly flat lid, the orifice naked (without peristome or annulus). Calyptra irregularly lacerate and adhering to the vaginule. Spores of two kinds, tetrahedral *macrospores*, and polyhedral *microspores*, the latter many times the smaller. On germination the macrospores first produce a thin prothallium, either filamentose in water or expanded in a kind of net work upon the ground, upon which leaf-buds are afterwards formed.

Like the *Andreæaceæ*, the *Sphagnaceæ* differ much from the true Mosses. In their mode of germination, the first evolution of the plant, and the form of the antheridia, they are related to the caulescent *Hepaticæ*. The structure of the stem, the imperfect calyptra, the organization of the capsule, and the two kinds of spores are without analogy among either the true Mosses or the *Hepaticæ*. The Order consists of only the following genus. For more detailed descriptions and full synonymy reference may be made to Schimper's *Torfmoose*, Braithwaite's *Sphagnaceæ or Peat-Mosses of Europe and North America*, Lindberg's *Europas och Nord Amerikas Hvitmossor*, and Husnot's *Sphagnologia Europæa*.

1. SPHAGNUM, Dill. (Pl. I.)

Character that of the Order.

§ 1. Acuta. *Branch-leaves erect: ducts forming part of the concave upper surface, triangular in cross-section, the portion included between the utricles being wedge-form, the free surface convex: stem-leaves large, bordered by narrow and flexuous hyaline cells; their utricles rarely fibrillose, mostly empty.*

1. **S. acutifolium,** Ehrh. Monœcious, green or more generally purplish; cortical zone of the stems a triple layer of cells destitute of pores; branches in fascicles of 3 to 5, spreading, one or two of them pendent: stem-leaves ovate or lingulate, erose or dentate at the apex, erect, the cells near the apex with a few slender fibrils or none, rarely porose; branch-leaves deeply concave, ovate-lanceolate, tapering to a truncate point, the upper lanceolate and subulate, all fibrillose, porose, and narrowly margined; perichætial leaves oblong, gradually acuminate, sinuose-dentate at the recurved apex, the cells irregular and empty: capsule long-pedicellate: spores ferruginous: male aments generally red. — Pl. Crypt. Exsic. n. 72; Schimp. Torfm. 56, t. 13; Braithw. Sphag. 66, t. 18–20. *S. nemoreum*, Scop.; Lindberg, Sphag. 52. *S. capillifolium*, Hedw., in part.

Var. **purpureum,** Schimp. Plants purple; the capitulum dense, subspherical: stem-leaves fibrillose.

Var. **fuscum,** Schimp. Plants rust-color, in very compact tufts; branches closely incurved, pale at the apex.

HAB. Very common, in open or shaded bogs, in valleys or on mountains.

Many other varieties could be described: var. *confertum*, *intermedium*, and *robustum*, Austin; *patulum* and *deflexum*, Schimper; *quinquefarium*, Lindb.; *elegans*, Braithw., etc.; the plants differing generally to some extent in their aspect according to their special habitat.

2. **S. rubellum,** Wils. Very much like the last, from which it differs in its dicœcious inflorescence, more slender and very soft stems, shorter and more obtuse oval-oblong branch-leaves 3-toothed at apex, and broad obtuse stem-leaves with utricles bipartite and sometimes fibrillose. — Bryol. Brit. 19, t. 60; Schimp. Torfm. 70, t. 20. *S. acutifolium*, var. *rubellum*, Russ.; Braithw. Sphag. 69, t. 19.

HAB. New Brunswick (*Fowler*). Rare or rarely observed in this country.

3. **S. strictum,** Lindb. Dicœcious, robust, yellowish-green; stems long, solid, with 3 or 4 cortical layers of porose cells; branches 3 to 5, curved and deflexed, two of them pendent: stem-leaves large, erect, lingulate-spatulate, erose-laciniate at the truncate apex, broadly margined and slightly appendiculate at base, with empty cells; branch-leaves erect-spreading, ovate-lanceolate, subulate at the top of the branches; cells closely fibrillose, with numerous pores; perichætial leaves oblong or

oval, emarginate at the obtuse apex, the utricles empty: male aments yellowish-brown: — Öfv. K. Vet. Ak. Förh. xix. 138, and Sphag. 49; Braithw. Sphag. 64, t. 17. *S. Girgensohnii*, Russ.; Sulliv. Icon. Musc. Suppl. 14, t. 5.

Var. **squarrosulum**, Russ. Plants small: branch-leaves recurved at the apex.

HAB. In swamps and bogs, New Jersey and Canada; the variety at Little Falls, New Jersey (*Austin*). A large form (var. *major*) is found in the White Mountains, New Hampshire.

4. **S. fimbriatum**, Wils. Closely allied to the last, differing in its glaucous-green color, the cortical cells in 2 or 3 layers, distinctly porose, the much larger stem-leaves ovate-spatulate and fimbriate at the upper border or from the middle, and the perichætial leaves much larger and with a closer areolation. — Bryol. Brit. 21, t. 60; Schimp. Torfm. 59, t. 15; Braithw. Sphag. 63, t. 16; Lindb. Sphag. 47.

HAB. In swamps of the Palisades, New Jersey (*White*); in the Sierra Nevada, California, at 11,000 feet altitude (*Brewer*).

§ 2. CUSPIDATA. *Branch-leaves longer and narrower, erect-spreading, undulate on the margin when dry: ducts with the broad base exposed upon the back of the leaf, cuneate between the utricles: stem-leaves small: cortical cells not porose.*

5. **S. cuspidatum**, Ehrh. Dicœcious, generally long and slender, floating in loose tufts, greenish: stems filiform; cortical cells large, in 2 (rarely 3) layers; branches in fascicles of 3 to 5, spreading or pendent, cuspidate by the convolute terminal leaves: stem-leaves triangular, 2–3-toothed at the apex, broadly margined; cells of the lower part long and narrow, the upper vermicular, fibrillose, not porose; branch-leaves loose, lanceolate-acuminate, deeply concave, denticulate at the apex, subulate toward the end of the branches; perichætial leaves distant, broadly ovate, truncate or obtuse at the apex, more or less fibrillose: capsules small, mostly long-pedicellate, scattered along the stem: spores light-brown. — Pl. Crypt. n. 251; Schimp. Torfm. t. 16; Braithw. Sphag. 82, t. 26, 27; Lindb. Sphag. 62; Sulliv. Icon. Musc. Suppl. 11, t. 2 (*S. laricinum*, Aust. Musc. Appalach. n. 31).

Var. **Torreyanum**. Very robust; branches in fascicles of 4 or 5, very long, flat, linear-lanceolate: leaves long-lanceolate,

spreading, broadly margined, erose-dentate at the apex. — *S. Torreyanum*, Sulliv. Mem. Amer. Acad. iv. 174, and Mosses of U. States, 13. *S. cuspidatum*, var. *Torreyi*, Braithw., in part.

Var. **falcatum**, Russ. Branches distinctly falcate at the apex. — Beitr. Torfm. 59.

Var. **plumosum**, Schimp. Tufts soft, compact; stems short and branches erect; leaves lanceolate-subulate. — *S. laxifolium*, Muell. Syn. i. 97.

Var. **plumulosum**, Schimp. Soft, as in the last; leaves shorter, very narrow.

Var. **serratum**. Stem-leaves broadly margined; upper branch-leaves serrate from the middle, those of the comal branches from the base. — *S. serratum*, Aust. Bull. Torr. Club, vi. 145.

Var. **hypnoides**, Schimp. Stems in short dense tufts, without branches; leaves lanceolate, tubular, hamate-secund. — *S. hypnoides*, Braun.

HAB. Ponds, and borders of streams flowing from bogs; not rare. Var. *Torreyanum*, in bogs at the South; vars. *plumosum* and *plumulosum* on alpine rivulets; var. *serratum*, at St. Augustine, Florida (*J. Donnell Smith*).

6. **S. intermedium**, Hoffm. Closely allied to the preceding. Stems and reflexed branches thicker; cortical cells small, in 2 or 3 layers: stem-leaves shorter, broader, triangular; branch-leaves broader, recurved at the apex; the perichætial closely imbricated: capsules on the tufted branches. — Braithw. Sphag. 78, t. 24, 25. *S. recurvum*, Beauv.; Brid. Bryol. Univ. i. 13; Schimp. Torfm. t. 16. *S. cuspidatum*, var. *Rauei*, Aust.; Rau & Harv. Cat. 49.

HAB. With the preceding.

7. **S. Lindbergii**, Schimp. Monœcious, robust, greenish-brown: cortical cells in 3 or 4 layers, unequal, without fibrils or pores: stem-leaves reflexed, close, broadly lingulate, fimbriate at the apex; branch-leaves ovate or oblong-lanceolate, dentate at the apex, shining, broadly margined downward, with numerous small pores in the upper part: capsule on a thick pedicel, urceolate when dry: spores yellow. — Torfm. t. 25; Braithw. Sphag. 77, t. 23; Lindb. Sphag. 60.

HAB. Wet sloping rocks of White Face Mountain, New York (*C. H. Peck*); very rare.

§ 3. Squarrosa. *Plants stout: branch-leaves squarrose from the middle: ducts medial, oval, inflated and free on both sides, or covered by the borders of the utricles on the upper surface of the leaves: cortical cells not porose.*

8. **S. squarrosum**, Pers. Monœcious, loosely and broadly cespitose, bluish-green: stems solid, rigid, simple or forking, with small cortical cells in two layers; branches in fascicles of 3 to 6: stem-leaves soft, spreading or reflexed, linguiform, rounded and fimbriate at the apex, the utricles without fibres or pores; branch-leaves oblong-lanceolate, 4-toothed at the apex, broadly margined by 2 or 3 rows of narrow cells, the utricles fibrillose and with some large pores on the borders; perichætial leaves very broad, subrevolute, thin, rounded at the apex: capsules numerous at and near the capitate apex, large, globose: spores yellow. — Schimp. Torfm. t. 17; Braithw. Sphag. 59, t. 14; Lindb. Sphag. 42.

Var. **squarrosulum**, Schimp. Plants pale, with slender stems: leaves scarcely half as large as in the normal form: fruit unknown. — Torfm. 71. *S. squarrosulum*, Lesq. Mem. Calif. Acad. i. 3.

Hab. Boggy places in woods; not rare. The variety in open mountain bogs; on Lassen's Peak, California, at about 5,000 feet altitude, forming by itself large bogs (*W. H. Brewer*).

9. **S. teres**, Angstroem. Dicœcious, loosely cespitose, yellowish brown; male plants in separate tufts, more slender than the female, with subglobose heads composed mostly of short flower-bearing branches: stems solid, with 2 to 4 cortical layers of unequal cells: stem-leaves large, oblong-ovate, rounded at the erose apex, the utricles empty; branch-leaves closely imbricate, ovate, abruptly short-acuminate, recurved at the obscurely dentate apex, the utricles fibrillose and porose; perichætial leaves large, concave or subrevolute, erose at the rounded apex: capsule terminal, globose. — Sulliv. Icon. Musc. Suppl. 13, t. 4; Schimp. Syn. 2 ed., 836. *S. squarrosum*, var. *teres*, Schimp. Torfm. 64; Braithw. Sphag. 62, t. 15.

Hab. Marshes in Southern New Jersey (*Austin*); rare.

10. **S. Wulfianum**, Girgens. Monœcious, large, rigid, brownish-green, the apex variegated green and red: stems dark-brown; cortical cells small, in 2 layers; branches 7 to 14, half of them subarcuate or horizontal, tumescent, the rest slender,

filiform, and pendent: stem-leaves small, reflexed, enlarged at the base, lingulate, obtuse, nearly entire, the utricles empty; branch-leaves small, ovate-lanceolate, dentate at the truncate apex, the upper lanceolate-subulate and narrowly margined, the utricles fibrillose and porose: perichætial leaves broadly oblong, obtusely pointed, with empty utricles: male aments short, capitate, on purple branchlets: capsules emerging from the tuft, globose. — Sulliv. Icon. Musc. Suppl. 18, t. 9; Braithw. Sphag. 75, t. 22; Lindb. Sphag. 57. *S. pycnocladum*, Angstr.

Hab. Canada (*Macoun, Fowler*); New York (*Howe, Peck, Austin*).

§ 4. Mollia. *Plants short, closely cespitose, very soft when moistened, brittle when dry: stem-leaves narrowly margined; branch-leaves short: ducts near the concave surface (except in* n. 14), *subcuneate with the broader side free, or entirely surrounded by the utricles.*

11. **S. rigidum**, Schimp. Monœcious, densely cespitose, rigid, glaucous-green above, whitish below, the small cortical cells in a double or triple layer; branches in close fascicles of 3 or 4, short, partly deflexed: stem-leaves erect, small, enlarged at the very base, obtuse-ovate or obtusely triangular; branch-leaves ovate-oblong, dentate at the apex, often contracted in the middle and cucullate above, the utricles fibrillose and with numerous unequal pores; the perichætial ovate or oblong-lanceolate, subfalcate, deeply emarginate or bidentate at the apex, the utricles fibrillose and porose: capsule immersed or short-pedicelled. — Torfm. t. 18; Braithw. Sphag. 56, t. 13. *S. compactum*, var. *rigidum*, Nees & Hornsch. *S. strictum*, Sulliv. Musc. Allegh. n. 201. *S. humile*, Schimp.; Sulliv. Icon. Musc. 5, t. 3.

Var. **squarrosum**, Russ. Pale green; branches spreading horizontally; leaves loose and squarrose.

Hab. In bogs, especially southward, from the pine-barrens of New Jersey to Florida; Yosemite Valley, in the spray of the Vernal Falls, and in rivulets at the foot of Mt. Dana (*Bolander*). The variety near Bethlehem, Pennsylvania (*Rau*).

12. **S. Muelleri**, Schimp. Delicate, pale-green: stems slender, the unequal cortical cells in three layers; branches in fascicles of 3 or 4, partly arcuate, partly flagelliform and pendent: stem-leaves large, oblong or obovate, slightly dentate at the apex, fibrillose and porose like the branch-leaves, which are

erect and clasping to the middle, subsquarrose above, oblong-lanceolate, with a narrow crenate border, the compressed ducts broader and free on the inner surface; perichætial leaves oblong, acuminate-lanceolate, coarsely dentate at and toward the apex, the utricles fibrillose and porose in the upper part only: spores yellow. — Torfm. t. 26; Sulliv. Icon. Musc. 9, t. 5. *S. molluscoides*, Muell. Syn. i. 99. *S. molle*, Aust. *S. molle*, var. *Muelleri*, Braithw. Sphag. 54, t. 12.

Hab. Florida (*Russell*); Lookout Mountain, Tennessee (*Lesquereux*); New Jersey (*Austin*).

13. **S. molle**, Sulliv. Dicœcious, densely cespitose, whitish-green: stems short (an inch or two high), with two cortical layers of quadrangular cells; branches close, 2 or 3 together, spreading: stem-leaves close, large, oblong, obtuse, spreading or deflexed, the utricles empty or slightly fibrillose and porose; branch-leaves very delicate, ovate-oblong, erect, convolute above, truncate-denticulate at the apex, the utricles with fibrils and thinly scattered spores; perichætial leaves imbricate, concave, constricted at the emarginate 2–3-toothed apex, utricles empty: capsule globose, exserted from the tufted branches. — Musc. Allegh. n. 205, Mosses of U. States, 13, and Icon. Musc. 7, t. 4; Braithw. Sphag. 53; Lindb. Sphag. 33. *S. tabulare*, Sulliv. Musc. Allegh. n. 204, and Mosses of U. States, 12. *S. compactum*, Brid., and var., Muell. Syn. ii. 539.

Var. **tenerum**, Braithw. Stems short, whitish; branches crowded: leaves acuminate, somewhat undulate. — Sphag. 55. *S. tenerum*, Sulliv. & Lesqx., Musc. Bor.-Amer. (1 ed.) n. 11; Sulliv. Mosses of U. States, 11.

Hab. Table Mountain, South Carolina (*Gray*); Tallulah Falls, Georgia (*Lesquereux*); Quaker Bridge, New Jersey (*James, Austin*).

14. **S. Garberi**, Lesqx. & James. Dicœcious, of medium size, green; stems very soft, the rather large cortical cells in three layers: stem-leaves small, deltoid-ovate, subcucullate, nearly entire at the apex, the utricles large, scarcely narrower along the margin, slightly porose and fibrillose toward the base; branch-leaves concave, imbricate at base, squarrose from the middle, dentate at the truncate apex, not margined, the large utricles closely fibrillose and porose, the very narrow ducts on the convex side of the leaf and nearly surrounded by the utricles; perichætial leaves deeply concave but not

vaginate, ovate-acuminate, subfalcate, erose at the apex: capsules from the tufted branches, small, reddish-brown. — Proc. Amer. Acad. xiv. 133. *S. humile* Austin, Bull. Torr. Club, vii. 2.

HAB. Florida (*Dr. A. P. Garber*).

§ 5. SUBSECUNDA. *Branch-leaves more or less secund or falcate, very fibrillose, more or less porose in the upper part: ducts medial, compressed or triangular, generally free on the broader side.*

15. **S. subsecundum,** Nees. Dicœcious, loosely cespitose, variously colored: stem solid, with a simple layer of cortical cells; branches in fascicles of 3 or 4, recurved or pendent, short: stem-leaves small, enlarged at base, deltoid or ovate, cucullate at the obtuse minutely fimbriate apex, the utricles fibrillose and porose in the upper part only; branch-leaves spreading, secund, ovate-acuminate, deeply concave, margined, 2–3-toothed at the apex, the utricles fibrillose and with numerous small pores, generally 2-ranked close to the walls; perichætial leaves oblong-acuminate, fibrillose in the upper part: capsules in the tufted branches: spores ferruginous. — Bryol. Germ. i. 17, t. 3; Schimp. Torfm. t. 22; Braithw. Sphag. 48, t. 9, 10; Lindb. Sphag. 28.

Var. **auriculatum,** Lindb. Stem-leaves distinctly auriculate. — Schimp. Torfm. 77, t. 24.

Var. **laxum.** Loosely cespitose, variegated in color: stem-leaves lingulate, obtuse; branch-leaves long-ovate, with cuneiform ducts near the convex surface; perichætial leaves very large. — *S. Lescurii,* Sulliv. Mosses of U. States, 11.

Var. **contortum,** Schimp. Dark green, with crowded and somewhat circinate branches: stem-leaves larger, the utricles fibrillose and porose their whole length; branch-leaves larger. — *S. contortum,* Schultz; Nees & Hornsch. Bryol. Germ. i. 15, t. 2, fig. 6.

Var. **obesum,** Schimp. Very stout, with tumid branches and large closely imbricate leaves. — *S. contortum,* var. *obesum,* Wils. Bryol. Brit. 22.

HAB. Peat-bogs, in the middle and northern sections, generally bordering ditches or filling depressions in the bogs.

16. **S. laricinum,** Spruce. Closely resembling the last, differing in the double or triple layer of cortical cells, the much

larger stem-leaves narrowed at base and emarginate at the apex, the shorter imbricate and appressed (not secund) branch-leaves, the utricles elongated and flexuous, with fewer small pores on both sides of the walls, and the narrowly oval ducts free on both faces. — Sulliv. Icon. Musc. Suppl. 17, t. 8; Braithw. Sphag. 44, t. 7, 8; Lindb. Sphag. 25. *S. contortum*, var. *laricinum*, Wils.

HAB. Marshes and bogs; Sand Lake, N. Y. (*C. H. Peck*); Gloucester County, Penn. (*E. A. Rau*).

17. **S. Mendocinum**, Sulliv. & Lesq. Elongated, floating, loosely cespitose, tawny above, yellowish white below; stems solid, the cortical cells in a simple or double layer; branches long and flexuous, in fascicles of 2 or 3, mostly open, not pendent: stem-leaves oblong-ovate, auricled at base, marginate, fibrillose and porose in the upper part; branch-leaves loosely imbricate, lanceolate, acuminate, subulate-dentate at the apex, the long flexuous utricles with close fibrils and numerous minute pores in rows on both sides of the walls; ducts medial and compressed, or narrowly triangular with the free base on the convex surface: fruit unknown. — Sulliv. Icon. Musc. Suppl. 12, t. 3. *S. auriculatum*, Lesq. in Mem. Calif. Acad. i. 4; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. (2 ed.) n. 23. *S. subsecundum*, var. *longifolium*, Lesq. l. c.

HAB. Swamps near Mendocino City, California (*Bolander*, 1867); bogs near King River, California, at 8–9,000 feet altitude (*Brewer*).

The species is allied to *S. cuspidatum* (to which it is referred by Braithwaite and Lindberg) in its habit and in the disposition of the ducts, to *S. subsecundum* in the structure of the leaves.

18. **S. tenellum**, Ehrh. Diœcious, soft and delicate, rarely cespitose, mostly floating, yellowish green or straw-color; stems loose, slender, very long and flexuous, the cortical cells distant in a double layer; branches short, solitary or 2 or 3 together, spreading or one of them reflexed: stem-leaves spreading or erect, large, oblong-ovate, obtuse, entire, densely fibrillose, with a few pores in the upper part; branch-leaves loosely incumbent, comparatively short, ovate-lanceolate, distinctly margined, erose at the apex, strongly fibrillose, with many small pores on the upper surface; perichætial leaves loosely imbricate, oblong-lanceolate or lingulate, fibrillose in the upper part: capsule small, thin-walled, ochraceous: spores large, yellow: male plants in separate tufts; aments small, orange-color. — Braithw.

Sphag. 42, t. 6; Lindb. Sphag. 22. *S. molluscum*, Bruch.; Schimp. Torfm. 71, t. 21.

HAB. Peat bogs; rare. Southern New Jersey (*Austin*); Canada (*Fowler*); Cascade Mountains, Oregon (*Newberry*).

§ 6. CYMBIFORMIA. *Plants robust: stem-leaves large, lingulate or spatulate; branch-leaves very concave, densely imbricate: cortical cells large, fibrillose and porose: ducts thick-walled, somewhat triangular, medial or near the concave surface of the leaf.*

19. **S. cymbifolium,** Ehrh. Dicœcious, densely cespitose when growing out of water, rarely floating, yellowish green or purplish; stems solid, simple or 2-parted, the cortical cells in 3 or 4 layers; branches in fascicles of 3 to 5, two of them pendent, the rest curved: stem-leaves generally reflexed, lingulate, rounded and erose at the apex, not margined, the utricles mostly empty or thinly fibrillose toward the apex; branch-leaves broadly ovate, narrowed and cucullate toward the apex, scabrous on the back by the perforation of the utricles, which are large and fibrillose, with few large pores, the ducts medial and narrowly oval; perichætial leaves small, ovate-lanceolate: capsule large, globose, dark-brown, stomatose: spores ferruginous: male plants slender, the aments rather thick, yellow. — Hannov. Mag. 1780, 235; Schimp. Torfm. 69, t. 19; Braithw. Sphag. 38, t. 5. *S. palustre*, Linn.; Lindb. Sphag. 16. *S. latifolium*, Hedw. *S. vulgare*, Michx. Fl. ii. 285.

HAB. Bogs and mountain rivulets; common and variable.

20. **S. papillosum,** Lindb. Much like the last and generally confounded with it. Cortical cells quadrangular, in four layers: stem-leaves rounded and minutely fringed at the apex; branch-leaves round-ovate, the ducts densely and minutely papillose where in contact with the utricles which enclose them; perichætial leaves oblong, plicate, the utricles empty in the lower part, porose and fibrillose above. — Act. Soc. Sc. Fenn. x. 280, and Sphag. 14; Austin, Musc. Appal. Exsicc. Suppl. n. 451; Braithw. Sphag. 35, t. 4.

HAB. New Jersey (*Austin*); Canada (*Fowler*); Pennsylvania (*E. A. Rau*).

21. **S. Austini,** Sulliv. Pale green, resembling the last two species in size and aspect, differing especially in the stem-leaves distinctly fimbriate, with the utricles porose and fibrillose

in the lower part, empty in the upper; branch-leaves denticulate above the middle and scabrous at the cucullate apex, with the triangular ducts free on the concave side of the leaf, and the walls of the utricles bordered by a fringe of rudimentary fibres; perichætial leaves large, oblong, obtuse, fimbriate at the apex: flowers monœcious, and the small capsule short-pedicellate. — Icon. Musc. Suppl. 9, t. 1; Austin, Musc. Appal. Exsicc. n. 2; Braithw. Sphag. 33, t. 3.

Hab. Swamps in Ocean County, New Jersey (*Austin, E. A. Rau*); also found in Sweden by Lindberg.

22. **S. Portoricense,** Hampe. Dicœcious (?), very large, generally floating, the exposed portion greenish, the immersed grayish brown; stems solid, the cortical cells in 3 or 4 layers, fibrillose and slightly porose; branches in fascicles of 4 or 5, some ament-like, attenuate at base, erect or arcuate, others longer, more slender and pendent: stem-leaves appendiculate or substipulate, broadly triangular-ovate, entire, the utricles without pores and with few fibrils; branch-leaves closely imbricate, cucullate and scabrous on the back at the apex, broadly ovate, obtuse, minutely fimbriate all around like the stem-leaves, narrowly margined, the utricles fibrillose and porose and with the walls made papillose by the bases of abortive fibrils; ducts as in the last species: fruit unknown. — Linnæa, xxv. 359; Austin, Musc. Appal. Exsicc. n. 1; Sulliv. Icon. Musc. 3, t. 2; Braithw. Sphag. 32, t. 2; Lindb. Sphag. 9. *S. Sullivantianum*, Austin, Am. Journ. Sci. 2 ser., xxxv. 253.

Hab. Manchester Pond, Ocean County, New Jersey (*Austin*); Atlantic County, etc., New Jersey (*E. A. Rau*). Described by Hampe from specimens collected in Porto Rico.

§ 7. Cyclophylla. *Loosely cespitose: stems short, with or mostly without short simple ament-like branches: leaves loosely imbricate, orbicular or ovate, broadly obtuse: ducts central, oval, thick-walled: cortical cells large, in a single layer. Plants generally destroyed by drought and annually reproduced from the prothallium.*

23. **S. cyclophyllum,** Sulliv. & Lesq. Dicœcious; plants ament-like, soft, prostrate or erect and loosely cespitose, of a whitish-glaucous color: leaves very large, round-ovate, flaccid, very entire, with two rows of thin marginal cells, the utricles long, flexuous, fibrillose, with minute pores along the borders;

perichætial leaves oblong-ovate, erose or truncate at the apex: capsule globose, small, immersed in the lateral bud-like perichætium: male aments upon short simple tufted branches. — Musc. Bor.-Am. Exsicc. (ed. 1), n. 5; Sulliv. Mosses of U. States, 11, Icon. Musc. 13, t. 6, and Suppl. 16, t. 7; Lindb. Sphag. 80. *S. obtusifolium*, var. *turgidum*, Hook. & Wils. in Drumm. Musc. Bor.-Amer. (Coll. II.), n. 17. *S. laricinum*, var. *cyclophyllum*, Lindb., in part.; Braithw. Sphag. 47, t. 8, fig. δ.

Hab. Growing in tufts in depressions in sandstone rocks or in sandy ground in the mountains of the Southern States from Alabama to Florida; floating in deep swamps near New Orleans; southern New Jersey, where it was discovered in fruit by Mr. Austin.

24. **S. sedoides,** Brid. Loosely cespitose, soft, purplish, the branches very short, scattered, simple or mere bud-like branchlets: leaves closely imbricated, oblong-ovate, obtuse, denticulate at and below the apex, narrowly margined, the utricles fibrillose, rarely porose: fruit unknown. — Bryol. Univ. i. 750; Sulliv. Musc. Allegh. n. 208, Mosses of U. States, 12, and Icon. Musc. 11, t. 6. *S. Pylaiei*, var. *sedoides*, Lindb.; Braithw. Sphag. 86, t. 28, B. Considered by Mueller (Syn. i. 92) to be a young state of *S. cymbifolium*.

Hab. Springy places, on Table Rock, South Carolina (*Gray, Lesquereux*); Mount Marcy, New York (*Torrey*).

25. **S. Fitzgeraldi,** Renauld, *in litt.* Plants in short compact whitish tufts; stems slender, with a single cortical layer of large rectangular-elongated cellules; branches single or two together, short, arcuate or pendent: stem-leaves oblong or obovate, truncate and dentate at the apex, auriculate at the base, bordered by two rows of very narrow cells; the utricles fibrose, without pores; branch-leaves narrow, linear-oblong, truncate, denticulate at the apex and along the borders to the middle; the marginal cells and utricles as in the stem-leaves; ducts medial, nearly square, much smaller than the utricles, but free on the lower and upper surface: flowers and fruit unknown.

Hab. Florida, on decaying leaves of palmetto (*C. H. Fitzgerald*).

Species allied to *S. sedoides*, Brid., differing in the stem-leaves, obovate and auriculate at base, those of the branches narrow, nearly linear, denticulate to the middle, truncate at the apex, and in the small square free intermediate ducts.

26. **S. Pylaesii,** Brid. Dicœcious, loosely cespitose, reddish brown, more robust than the preceding; branches solitary or

fascicled in twos or threes, short, arcuate, filiform: leaves of the stem, branches and perichætium oblong-ovate, broadly obtuse, entire or erose at the apex: capsule small, globose, immersed on short lateral branches: male plants more robust, the aments in the upper slightly inflated branches. — Bryol. Univ. i. 749; Sulliv. Icon. Musc. 12, t. 6, and Suppl. 15, t. 6; Braithw. Sphag. 85, t. 28, excl. var. *S. cymbifolium, forma juvenilis*, Muell. Syn. i. 92. *S. sedoides*, var., Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. (ed. 1), n. 4.

Hab. Same as the preceding; stagnant marshes, Southern New Jersey, in fruit (*Austin, J. Donnell Smith*).

§ 8. Abnormia. *Stems and branch-leaves with porose cells and no fibres. Plants of large size, shining when dry.*

27. **S. macrophyllum,** Bernh. Dicœcious, very long, generally floating, dark olive-green or brown; stems solid, with a double or triple layer of thick-walled transversely oval or subquadrate cells; branches in fascicles of 3 or 4, diverging and spreading: stem-leaves small, ovate, enlarged at base, tapering to an obtuse apex, entire; branch-leaves rigid, narrowly lanceolate, subulate, denticulate at the convolute apex, the utricles long and fusiform, with pores in longitudinal rows in the middle, the nearly circular thin-walled ducts central and free on both sides: perichætium lateral and tufted, with oblong-lanceolate obtuse leaves, denticulate at the apex: capsule globose, short-pedicellate: spores sulphur-yellow, tetrahedral and papillose: male flowers unknown. — Brid. Bryol. Univ. i. 10; Sulliv. Musc. Allegh. n. 207, Mosses of U. States, 12, and Icon. Musc. 1, t. 1.; Braithw. Sphag. 87, t. 29; Lindb. Sphag. 72.

Var. **Floridanum,** Aust. Areoles of the leaves twice as long as in the normal form, with 40 to 70 minute pores in two rows. — Bull. Torrey Club, vii. 15. *S. cribrosum*, Lindb. Sphag. 74.

Hab. Swamps of the Southern States, from New Jersey to Florida, rarely fruiting; the variety in Florida (*Austin, J. Donnell Smith*).

Order II. ANDREÆACEÆ. Schizocarpous Mosses.

Plants ascending from a prostrate rooting base, of dark color and generally black, branching by innovations from under the flower-bearing apex, and dichotomous. Leaves thickish, open or falcate-secund, papillose or warty; areolation circular or hexagonal in the upper part, quadrate in the lower, sinuous-vermicular at base. Flowers monœcious or diœcious, terminal, gemmiform. Calyptra very thin, closely adherent. Capsule oval, immersed in the large perichætium before maturity and then protruded by the elongation of the receptacle or vaginule, splitting from the collum upward into 4 or rarely 6 equal segments, which cohere at the quadrangular apex. Spores small, at first coherent by fours in glomerules.

Plants cespitose, growing on rocks in alpine or subalpine localities; all the American species monœcious.

1. ANDREÆA, Ehrh. (Pl. 1.)

The only genus. Characters as of the Order.

1. **A. petrophila,** Ehrh. Leaves spreading, rarely secund, ovate and oblong-lanceolate, concave, oblique at the hyaline crenulate apex, papillose on the back, ecostate; perichætial leaves convolute, light-yellow. — Beitr. i. 192; Bryol. Eur. t. 628; Braithw. Brit. Moss-Fl., i. 6, t. 1, A. *A. rupestris,* Hedw.

Hab. Wet granitic rocks, on high mountains; very variable.

2. **A. rupestris,** Turn. Leaves erect, subimbricate at the ovate base, open, linear-lanceolate, spreading, incurved or subsecund at the apex; costa depressed, excurrent; areolation punctiform, striate. — Musc. Col. Hyb. Spec. 14; Bryol. Eur. t. 631. *Jungermannia rupestris,* Linn. Fl.-Suec. 1045. *A. Rothii,* Web. & Mohr; Braithw. l. c. 12, t. 2, A.

Hab. On rocks, with the preceding; common in the mountains of Georgia and Carolina, descending to the plains northward. On gneiss rocks near Yonkers, New York, on the borders of the Hudson (*E. C. Howe*).

3. **A. crassinervia,** Bruch. Stem prostrate, fragile: leaves falcate-secund, oblong at base, abruptly lanceolate, cuspidate by the semiterete excurrent costa, papillose at the apex; perichætial leaves large: capsule small, short-necked. — Denkschr. Acad. Muench. 1828, 279, t. 10; Bryol. Eur. t. 633; Braithw. l. c. 11, t. 1, C.

Hab. Mountains of New England (*Oakes*).

Order III. BRYACEÆ. True Mosses.

Plants generally low and tufted, from a filiform prothallium, with short, fleshy or hard, elongated, round or slightly compressed, rarely angular stems, either rooting at base and erect, bearing the organs of fructification at the apex (*Acrocarpi*) and continued by innovations from below the flowers, or procumbent and creeping, rooting at intervals through their whole length, and bearing flowers on short lateral branches (*Cladocarpi*), or in buds at the axils of the leaves (*Pleurocarpi*). Leaves inserted at right angles to the stems, open-spreading or oblique-erect, composed of a single layer of cells, rarely of two or three, simple-nerved in the middle or binerved at base or nerveless. Flowers gemmaceous or inclosed in involucral leaves (*perichætium* and *perigonium*), rarely discoid or exposed to view, surrounded by open involucral leaves at the apex of the stems, syncœcious, autœcious, moncœcious or dicœcious. Capsule globular, oblong, oval or cylindrical, traversed lengthwise by the columella, irregularly breaking around in the middle at maturity for the emission of spores, or more generally opening at its upper part by a cover (*operculum*) detached by the inflation of the cells of the *annulus* and exposing the orifice, which is either naked (*gymnostome*) or surrounded by a simple or double peristome attached to the inner border of the capsule. The simple or outer peristome is composed of 4 to 32 teeth or more, coherent in pairs; the inner is formed of a yellowish pellucid membrane attached to

the inner base of the teeth, dividing above into 16 lanceolate double segments, which are carinate on the outside by the cohesion of the segments their whole length, or cleft along the divisural line and disjoined, or adhering merely by prominent articulations and thus perforated on the keel; segments alternating with the teeth of the external peristome and often separated by 1 to 3 filiform articulate or more rarely transversely laciniate or appendiculate cilia. Spores of one kind only, filling the inner sac of the capsule, dispersing at maturity and producing by germination the filiform prothallium, from which sprout the primitive buds of the plants.

Systematic Arrangement of Tribes and Genera.

SERIES I. ACROCARPI. Flowers terminal, becoming lateral only by innovations from under the flowers.

A. Dehiscence of the capsule irregular, transverse.

TRIBE I. PHASCEÆ. Plants minute. Leaves soft, very loosely areolate. Capsule globular, immersed, subsessile or short-pedicellate.

* Plants bud-like, on a persistent prothallium. Leaves nerveless, except in one species.

Calyptra minute, closely adhering. **1. Micromitrium.**

Calyptra larger, campanulate. **2. Ephemerum.**

* * Leaves distinctly nerved. Prothallium none.

Caulescent. Capsule globose, apiculate. Calyptra campanulate. **3. Physcomitrella.**

Stemless. Capsule enclosed in a cluster of imbricate concave leaves. **4. Sphærangium.**

Caulescent. Capsule pedicellate. Calyptra cucullate. **5. Phascum.**

Plants larger; stems divided. Capsule ovate. Calyptra cucullate. **6. Pleuridium.**

Stemless. Leaves more closely areolate, minutely papillose on the back. **7. Microbryum.**

Caulescent. Capsule apophysate, except in one species. Calyptra mitrate. **8. Bruchia.**

Capsule globose. Calyptra irregularly torn. Spores very large and few. **9. Archidium.**

B. Capsule dehiscing by a deciduous operculum.

TRIBE II. WEISIEÆ. Plants cespitose. Leaves simply costate; areolation opaque, punctiform or quadrate, generally papillose in the upper part, oblong-hexagonal, pellucid or chlorophyllose in the

lower. Operculum rostrate. Peristome simple or none. Calyptra cucullate.

* Peristome none.

Plants small. Capsule erect; operculum strongly adherent. **10. Astomum.**

Plants larger. Operculum long-beaked, deciduous. **11. Gymnostomum.**

Plants large, dichotomously divided, as in *Pleurocarpi*. **12. Ancectangium.**

* * Peristome simple, of 16 teeth, irregularly splitting or perforated.

Plants small. Capsule long-pedicellate. Teeth transversely articulate, entire or perforated. **13. Weisia.**

Plants large. Perichætium sheathing. Teeth more distinctly articulate, entire or bifid at apex. **14. Dicranoweisia.**

Leaves soft, coarsely papillose, serrulate above. Capsule slightly curved. **15. Oreoweisia.**

Leaves minutely papillose on both faces. Capsule striate, erect. **16. Rhabdoweisia.**

Leaves minutely crenulate. Capsule short, ovate, with a distinct collum regular or strumose. Teeth irregularly split. **17. Cynodontium.**

Leaves enlarged, sheathing at base, irregularly serrulate. Teeth 2–3-cleft to the middle. **18. Dichodontium.**

* * * Teeth regularly bifid to the middle (Dicranoid). Leaves smooth; basilar areolation quadrate, enlarged at the angles.

Leaves lanceolate-subulate. Capsule arcuate with a long narrow collum. **19. Trematodon.**

Stems nearly simple, filiform. Capsule small, erect, subglobose. **20. Angstrœmia.**

Plants small. Capsule cernuous. Segments of the teeth filiform, granulose. **21. Dicranella.**

Plants large. Leaves spreading or secund, not or scarcely sheathing; costa strong, more or less dilated toward the base. **22. Dicranum.**

Leaves long, setaceous-subulate, the upper part filled by the broad costa; basilar areolation much enlarged, brown at the angles. **23. Dicranodontium.**

Capsule on a curved flexuous pedicel. Calyptra cucullate, ciliate at base. **24. Campylopus.**

Plants frondose. Leaves distichous, conduplicate in the lower part, alate on the back, expanded above into a simply costate lamina. Peristome of *Dicranum*. (*Subtribe* FISSIDENTEÆ.)

Frond-like; not aquatic. **25. Fissidens.**

Plants slender, branching and floating. Leaves distant. **26. Conomitrium.**

Plants soft, spongy, whitish yellow. Leaves thick, composed of three superposed layers of cells, with intercellular simple narrow ducts. (*Subtribe* LEUCOBRYEÆ.)

Peristome of *Dicranum*. **27. Leucobryum.**

Peristome of 8 short teeth. 28. **Octoblepharum.**

Leaves lanceolate-subulate, clasping at base, open, spreading or distichous; costa strong, percurrent. Capsule ovate-cylindrical, erect or inclined, long-pedicellate. Teeth of the peristome 16, divided to near the base into two equal strongly articulate segments, or irregularly split; none in *Eustichia*. (*Subtribe* CERATODONTEÆ.)

Leaves strongly costate. Capsule ovate-oblong, striate. 29. **Ceratodon.**

Leaves long-subulate from an oblong sheathing base. Capsule narrow, cylindrical. 30. **Trichodon.**

Leaves distichous, subulate from the half-clasping base. 31. **Distichium.**

Leaves distichous, canaliculate-plicate, closely imbricate. 32. **Eustichia.**

Plants generally minute. Leaves open, narrow. Capsule erect, tumid at the collum, turbinate when dry. Peristome none, or simple, and of 16 smooth acute or obtuse teeth. (*Subtribe* SELIGERIEÆ.)

Peristome none. 33. **Anodus.**

Plants small. Peristome of 16 teeth, solid, without a divisural line. 34. **Seligeria.**

Plants large. Areolation of the leaves enlarged, orange-colored at the basal angles. 35. **Blindia.**

Plants very small. Calyptra mitriform. Teeth hyaline-punctulate. 36. **Brachyodus.**

Plants small; pedicel long, slender, geniculate. Teeth subulate. 37. **Campylosteleum.**

TRIBE III. POTTIEÆ. Branches fastigiate by innovations. Leaves with a parenchymatose quadrate-hexagonal areolation, papillose and chlorophyllose in the upper part, dilated and hyaline at base. Capsule erect, narrowly oval or cylindrical. Peristome rarely absent, generally of 16 flat membranous teeth, sometimes simple or rudimentary, mostly split to the base into 32 terete filiform obscurely articulate segments.

Capsule immersed. Peristome none. 38. **Pharomitrium.**

Capsule erect, pedicellate. Peristome none or imperfect, of 16 flat teeth. 39. **Pottia.**

Teeth slender, linear-lanceolate, confluent at base, entire or cleft above. 40. **Didymodon.**

Leaves lanceolate-subulate, glossy. Teeth cleft to the base into two linear unequal segments. 41. **Leptotrichum.**

Leaves gradually lengthening from the base upward. Teeth cleft to the base into two equal very papillose, half-terete segments, entire or irregularly interrupted. 42. **Trichostomum.**

Leaves ovate or obovate. Segments subterete or tetragonal-filiform, free or irregularly transversely connate, erect or slightly twisted to the left. Columella projecting beyond the orifice. 43. **Desmatodon.**

Teeth divided to the base into long filiform segments, twisted to the left, borne upon a more or less elongated tessellate membrane. 44. **Barbula.**

TRIBE IV. GRIMMIEÆ. Plants tufted or pulvinate. Leaves short, solid, often piliferous-acuminate; areolation dense, obscure, punctiform, minutely round-quadrate and chlorophyllose above. Capsule regular, on a straight or arcuate pedicel. Teeth 16, transversely articulate, entire, cribrose or variously cleft, rarely absent. Calyptra generally mitriform, sometimes split on one side or lobed.

Plants floating in long tufts. Calyptra cucullate. Teeth cancellate. — 45. **Cinclidotus.**

Leaves hair-pointed. Calyptra lobate-mitrate. Capsule emerging on an arcuate pedicel; teeth cribrose or lacunose. — 46. **Grimmia.**

Plants pulvinate. Capsule immersed. Teeth cribrose. — Subgen. *Schistidium.*

Capsule immersed. Lid persistent. Teeth 32. — Subgen. *Scouleria.*

Capsule on a short curved pedicel. Teeth none, or cleft or perforated. — Subgen. *Gasterogrimmia.*

Capsule erect on a straight pedicel. — Subgen. *Gumbelia.*

Plants large. Calyptra mitriform-subulate. Teeth irregularly cleft to below the middle, or to the base into two filiform segments. — 47. **Racomitrium.**

Leaves hyaline, ciliate at apex. Capsule immersed. Peristome none. — 48. **Hedwigia.**

Capsule long-pedicelled, pyriform or turbinate. — 49. **Braunia.**

TRIBE V. ORTHOTRICHEÆ. Plants tufted. Leaves of close texture, as in *Grimmia*. Calyptra mitriform (cucullate in n. 53 and 54), plicate, often hairy. Peristome rarely absent, simple or double, the outer of 8 bigeminate or 16 geminate flat short lanceolate entire or perforated teeth, the inner of 8 or 16 simple filiform cilia or lanceolate segments.

Calyptra covering the capsule to the base. Teeth cribrose. — 50. **Coscinodon.**

Calyptra covering the capsule to the middle. Teeth narrowly lanceolate. — 51. **Ptychomitrium.**

Calyptra covering the capsule to below the base, plicate and cleft at base. Teeth entire. — 52. **Glyphomitrium.**

Capsule striate, urceolate. Calyptra cucullate. — 53. **Amphoridium.**

Calyptra large, cuculliform. Teeth short, truncate. — 54. **Drummondia.**

Leaves long, flexuous, crisp when dry. Calyptra hairy. — 55. **Ulota.**

Leaves shorter, striate when dry. Capsule mostly immersed, 8–16-striate. Calyptra campanulate, naked or hairy. — 56. **Orthotrichum.**

Calyptra campanulate, plicate, laciniate at base. — 57. **Macromitrium.**

Calyptra campanulate, not plicate. Teeth spirally revolute. — 58. **Schlotheimia.**

Calyptra very large, cylindrical-campanulate, covering the whole capsule. — 59. **Encalypta.**

Calyptra twisted, persistent, plicate, constricted at base, enclosing the capsule. Peristome none. — 60. **Calymperes.**

Calyptra cucullate-dimidiate. Peristome of 16 horizontal teeth. 61. **Syrrhopodon.**

TRIBE VI. TETRAPHIDEÆ. Plants tufted. Leaves and areolation nearly as in *Bryeæ*. Peristome composed of the cellular part of the lid, divided into 4 broadly lanceolate teeth.

Caulescent. Calyptra thin, white, reddish at apex. 62. **Tetraphis.**

Stemless. Calyptra covering the capsule to the base. 63. **Tetrodontium.**

TRIBE VII. DISCELIEÆ. Plants gemmiform, very small. Leaves not costate. Capsule oval, pedicellate. Peristome of 16 simple teeth, split at base.

Character of the Tribe. 64. **Discelium.**

TRIBE VIII. SCHISTOSTEGEÆ. Plants annual, from a colored prothallium, delicate, dimorphous; the sterile frondiform, with leaves verticillate and confluent at base; the fertile frondiform in the lower part only, with apical flowers and a few minute horizontally tufted leaves. Capsule small. Peristome none.

Single genus. 65. **Schistostega.**

TRIBE IX. SPLACHNEÆ. Plants and leaves of soft loose texture. Male flowers discoid. Capsule with an apophysis varying in shape and size.

* Calyptra mitriform. Apophysis not discolored by age.

Leaves ovate or spatulate, obtuse. Peristome of 16 short or truncate teeth. 66. **Dissodon.**

Leaves long, spatulate-acuminate. Teeth of the peristome long, attached below the orifice of the capsule. 67. **Tayloria.**

* * Calyptra small, conic, entire or cucullate. Apophysis discolored by age.

Leaves more densely reticulate. Teeth solid, bigeminate. 68. **Tetraplodon.**

Leaves tufted; areolation very loose. Apophysis enlarged after maturity, becoming subglobose and colored. 69. **Splachnum.**

TRIBE X. PHYSCOMITRIEÆ. Plants short, soft. Leaves large; areolation very large, hyaline. Capsule rarely symmetrical, generally cernuous and gibbous. Peristome absent or of 16 teeth, inclined to the right, with an inner membrane divided into irregular segments or rudimentary.

Calyptra large, tetragonal, enfolding the capsule. 70. **Pyramidula.**

Capsule subglobose, splitting in the middle at maturity without decoloration on the line of separation. 71. **Aphanorhegma.**

Capsule pyriform, regularly dehiscent; orifice narrow. Peristome none. 72. **Physcomitrium.**

Capsule cernuous or pyriform. Peristome of 16 articulate teeth. 73. **Entosthodon.**

Capsule cernuous, or erect at base, curved above. Peristome of 16 teeth curved to the right, with an internal membrane rudimentary or divided into segments. **74. Funaria.**

TRIBE XI. BARTRAMIEÆ. Leaves papillose on both faces; areolation minute, quadrate in the upper part of the leaves. Capsule nearly spherical, cernuous, ribbed when dry. Peristome none, simple or double.

Stems erect, tomentose, with dichotomous branches. Teeth of the peristome, when formed, attached to the basilar membrane above the orifice. **75. Bartramia.**

Plants small. Leaves 5-ranked, imbricate. Teeth of the peristome connivent in a cone. **76. Conostomum.**

Plants long, branching in dichotomous innovations and fasciculate branchlets. **77. Philonotis.**

TRIBE XII. MEESIEÆ. Leaves 3–8-ranked. Capsule long-pedicellate and long-necked, cernuous. Peristome double; outer teeth much shorter than the 16 segments of the carinate membrane, absent in *Catoscopium*.

Capsule very small, globose, thick, black. Teeth of the peristome short. **78. Catoscopium.**

Leaves thin, remote, very loosely areolate, pellucid. **79. Amblyodon.**

Areolation of the leaves small, rectangular, chlorophyllose. **80. Meesia.**

Stems nearly simple. Leaves abruptly reflexed from the middle. Peristome of *Webera*. **81. Paludella.**

TRIBE XIII. BRYEÆ. Plants of various size. Leaves simply costate, generally dentate; areolation equal, smooth. Capsule globose, ovate or pyriform, cernuous, horizontal or pendent, very rarely erect. Peristome generally double; teeth transversely barred; inner membrane divided into segments alternating with the teeth, generally separated by cilia.

Peristome simple. Teeth narrowly linear, with nodose articulation. **82. Mielichhoferia.**

Leaves narrow, subulate. Capsule long-necked. Peristome double. Cilia appendiculate. **83. Leptobryum.**

Leaves lanceolate, glossy, thinly costate: areolation narrow, linear-hexagonal. Capsule short-necked. Inner membrane broad; cilia smooth. **84. Webera,** proper

Capsule thinner, long-necked, horizontal. Inner membrane narrow: segments entire; cilia none or very short. Subgen. *Pohlia.*

Cellules of the areolation rhombic-hexagonal, loose, solid. Capsule pyriform, mostly regular. Teeth of the peristome lobed; segments adhering to the peristome or free; cilia fragmentary, or 2 or 3, generally appendiculate. — Inner peristome free; mem-

brane large; segments perfect, with 2 or 3 appendiculate cilia. **85. Bryum**, proper.

Cilia and segments adhering to the teeth. Subgen. *Ptychostomum.*

Cilia and segments free; cilia more or less perfect. Subgen. *Cladodium.*

Plants large. Comal leaves rosulate. Flowers dicœcious, discoid. Subgen. *Rhodobryum.*

Leaves soft, greenish white. Capsule very long-necked, recurved. **86. Zieria.**

Plants and leaves large. Upper leaves rosulate; areolation very large, round-hexagonal. **87. Mnium.**

Teeth of the peristome short, adhering to a long cupuliform reticulated inner membrane pierced at top by the columella. **88. Cinclidium.**

Leaves long, solid. Capsule obconical, cernuous, enlarged at the orifice. Peristome double, perfect. **89. Rhizogonium.**

Capsule erect, cylindrical-oblong. Teeth long; membrane short, entire or divided into segments; cilia none. **90. Leptotheca.**

Plants radiculose-tomentose. Leaves densely areolate. Capsule oblong, cernuous. Peristome of *Mnium*. (*Subtribe* AULACOMNIEÆ.) **91. Aulacomnium.**

Leaves subequal; areolation round-hexagonal, papillose in the upper part. Capsule oblong, horizontal, obscurely striate. Peristome double; outer teeth connate at base; inner membrane divided into nodose filiform appendiculate segments or cilia united in fours. (*Subtribe* TIMMIEÆ.) **92. Timmia.**

TRIBE XIV. POLYTRICHEÆ. Plants woody. Leaves thick, lamellate inside. Peristome simple, of 32 or 64 solid linguiform teeth, adhering to the membranous enlarged top of the columella.

Leaves not sheathing at base. Calyptra cucullate, spinulose at the apex only. Peristome of 32 teeth. **93. Atrichum.**

Leaves subtubulose at apex. Calyptra large, sparsely hairy. Capsule thin. Teeth irregular. **94. Oligotrichum.**

Calyptra very narrow, smooth. Capsule oval-globose, incurved and laterally compressed. **95. Psilopilum.**

Leaves thick, clasping at base; lamellæ covering the whole lamina. Capsule cylindrical-oblong. **96. Pogonatum.**

Plants large. Capsule quadrate or hexagonal on a short subglobose apophysis. Teeth 64. **97. Polytrichum.**

TRIBE XV. BUXBAUMIEÆ. Stemless plants with large oblique ventricose capsules. Peristome double, the outer rudimentary, the inner membranous, twisted into a 16–32-plicate truncate cone.

Basilar leaves lingulate. Capsule yellowish green, gibbous-ovate. **98. Diphiscium.**

Leaves dentate-ciliate, not costate. Capsule solid, blackish. **99. Buxbaumia.**

SERIES II. CLADOCARPI. Fruit terminal on short lateral branches.

TRIBE XVI. FONTINALEÆ. Aquatic plants, rooting at base only, floating. Leaves thin. Flowers diœcious. Calyptra cucullate. Teeth of the double peristome linear; inner membrane divided into long cilia forming a latticed cone by transverse partitions, or the cilia free, longer than the teeth, appendiculate.

Cilia united into a cone by transverse partitions. 100. **Fontinalis.**

Cilia simple or appendiculate, latticed in the upper part only. 101. **Dichelyma.**

SERIES III. PLEUROCARPI. Fruit lateral, sessile upon the stems or branches. Flowers in axillary buds.

TRIBE XVII. NECKEREÆ. Primary stems creeping; the secondary erect or creeping, with dichotomous or pinnate branches. Leaves smooth, minutely areolate. Capsule generally immersed in the perichætium. Calyptra cucullate-conical, often hairy. Peristome simple or double, rarely absent.

Peristome double; teeth linear-lanceolate; segments very narrow, linear; cilia none. Calyptra rough or papillose. 102. **Cryphæa.**

Peristome simple. Vaginule and calyptra hairy. 103. **Leptodon.**

Secondary stems dendroid; paraphyllia multiform. Peristome double; segments long-linear, enlarged and carinate at base, with or without cilia. 104. **Alsia.**

Plants erect or pendent. Leaves flat, glossy. Peristome double; inner membrane divided into filiform segments. 105. **Neckera.**

Plants distichous. Leaves diverging sidewise, cultriform. Capsule long-pedicellate. Peristome double. 106. **Homalia.**

Plants long, pendent. Leaves cordate-clasping. Peristome double. 107. **Meteorium.**

TRIBE XVIII. LEUCODONTEÆ. Primary stems creeping; the secondary erect or pendent, simple or ramose. Leaves solid, subscarious, plicate lengthwise; areolation in distinct rows, punctiform-angular. Calyptra large, cucullate.

Leaves decurrent, not costate. Peristome simple; teeth distantly articulate, 2–3-cleft at apex. 108. **Leucodon.**

Leaves slightly papillose on the back. Peristome double. Teeth short; segments short, imperfect; cilia none. 109. **Pterigynandrum.**

Leaves scarious, glossy; areolation very small, smooth. Calyptra sparingly hairy. Peristome double; segments half as long as the teeth. Cilia none. 110. **Pterogonium.**

Calyptra smooth. Peristome double. Teeth narrowly lanceolate-subulate; segments shorter than the teeth, subulate; basilar membrane none. 111. **Antitrichia.**

TRIBE XIX. HOOKERIEÆ. Plants small, soft, hypnoid; areolation large. Calyptra conical-mitrate. Peristome double.

Leaves bicostate, often margined, more or less distinctly serrate. 112. **Hookeria.**

Leaves plane, large, very obtuse, not costate; areolation very large. 113. **Pterygophyllum.**

TRIBE XX. FABRONIEÆ. Plants very small. Leaves thin, delicate, ciliate-dentate or entire. Capsule pyriform, with a distinct collum. Calyptra cucullate, split on one side. Peristome simple or none.

Leaves delicate, not costate, dentate-ciliate. Calyptra thin. 114. **Fabronia.**

Plants more robust. Leaves entire, thinly costate to the middle. Peristome double; segments shorter than the teeth. 115. **Anacamptodon.**

Plants very small. Leaves squarrose when moist, entire. Peristome simple. 116. **Habrodon.**

Plants minute. Leaves minutely serrulate above. Capsule thin, constricted under the orifice. Teeth of the simple peristome very irregular. 117. **Clasmatodon.**

TRIBE XXI. LESKEACEÆ. Primary stems creeping. Leaves soft, areolation minute, hexagonal, papillose and chlorophyllose above, hexagonal-rectangular below. Capsule symmetrical, erect or curved. Peristome double; teeth linear-lanceolate, subulate; segments shorter than the teeth; cilia none or rudimentary, rarely perfect.

Plants glaucous yellow. Leaves pellucid; cells conspicuously papillose. Capsule cylindrical, erect; membrane broad, carinate, without segments. 118. **Thelia.**

Branches julaceous. Leaves glaucous green, closely imbricate. Capsule suberect, long-pedicellate, inflated at the collum. Peristome double, perfect. 119. **Myurella.**

Plants small. Leaves soft, costate, papillose on both faces (except in one species). Capsule oblong, erect or subarcuate, thin. Segments of the peristome narrow, linear; cilia none. 120. **Leskea.**

Leaves with a minute chlorophyllose punctiform obscure areolation, papillose on both faces. Capsule erect, cylindrical-oblong, regular. Teeth pale; segments short, narrowly linear. 121. **Anomodon.**

TRIBE XXII. ORTHOTHECIEÆ. Plants in wide yellow mats. Leaves smooth; areolation narrowly rhomboidal or linear, quadrate at the basal angles. Capsule erect, symmetrical. Peristome double.

Leaves densely crowded, glossy, not costate. Calyptra dimidiate, long, twisted. Segments of the peristome narrowly linear, as long as the teeth; cilia none. 122. **Platygyrium.**

Leaves spreading or subsecund, not costate, glossy. Teeth of the peristome hyaline-bordered; segments linear-subulate, longer than the teeth; cilia rudimentary. 123. **Pylaisia.**

Leaves long, thinly costate. Calyptra hairy. Capsule soft, regular. Membrane narrow; segments shorter than the teeth, with or without cilia. 124. **Homalothecium.**

Plants large, more or less compressed. Leaves costate, entire. Capsule cylindrical, long-pedicellate. Teeth distantly articulate; segments very narrowly linear; cilia none. 125. **Cylindrothecium.**

Plants large, dendroid. Leaves in two forms, squamiform on the stems. Calyptra long, dimidiate, clasping the top of the pedicel. Capsule oblong-cylindrical, long and long-pedicellate. Segments as long as the teeth, cleft to the base; cilia none. 126. **Climacium.**

Plants yellow. Leaves sulcate, not costate. Capsule erect or slightly incurved. Teeth of the peristome hyaline-bordered; segments as long, linear; cilia short or none. 127. **Orthothecium.**

TRIBE XXIII. HYPNEÆ. Plants of very variable habit. Leaves of diverse forms, spreading or squarrose, rarely erect, often secund or falcate, with or without costa or bicostate at base, generally scarious, smooth and glossy; areolation parenchymatous, more or less narrowed, sometimes very narrow and vermicular, quadrate and enlarged at the basal angles. Vaginule attached to a perichætial generally rooting branchlet. Calyptra cucullate. Capsule long-pedicellate, cernuous or horizontal, more or less incurved. Peristome double, generally perfect, with 2 or 3 cilia appendiculate or articulate. — A single genus, represented in this work by nearly 200 species, divided into 28 subgenera, which are considered as genera by most recent bryologists. 128. **Hypnum.**

SERIES I. ACROCARPI.

Fruit terminal, becoming lateral only when thrown aside by innovations from under the flowers.

A. CLEISTOCARPI. — Capsule falling off with the pedicel or from it at maturity, dehiscing irregularly transversely in the middle for the emission of the spores.

TRIBE I. PHASCEÆ.

Plants very small, soft. Leaves loosely areolate. Capsule globular, immersed, subsessile or short-pedicellate.

1. *Plants stemless, from a more or less persistent prothallium.*

1. MICROMITRIUM, Aust.

Plants scarcely visible without the glass. Leaves ecostate. Inflorescence syncœcious. Capsule globose, apiculate or pointless. Calyptra very small, closely adherent. Spores few, large.

Scarcely distinct from *Ephemerum*.

1. **M. megalosporum,** Aust. Leaves broadly ovate lanceolate, obtusely serrate: capsule pale, globose, apiculate; vaginule large, ovate, truncate; calyptra concentric: spores nearly smooth. — Musc. Appal. n. 47; Sulliv. Icon. Musc. Suppl. 20, t. 11. *Ephemerum tenerum*, Bruch; Bryol. Eur. t. 1. *Nanomitrium tenerum*, Lindb. Manip. Musc. ii. 409.

Hab. On broken clayey ground, with the following; very rare (*Austin*).

2. **M. Austini,** Aust. Leaves open, recurved, lingulate-lanceolate, remotely serrate in the upper part: capsule apiculate; calyptra concentric: spores slightly papillose, of ¼ the diameter of the preceding. — Musc. Appal. n. 45; Sulliv. Icon. Musc. Suppl. 21, t. 12. *Ephemerum Austini*, Sulliv. Ms.

Hab. Wet ground in woods; Closter, New Jersey (*Austin*).

3. **M. synoicum,** Aust. Much like the last: leaves longer, more distant, erect, obscurely serrulate: capsule pointless, sometimes in pairs in the same perichætium; calyptra generally excentric or on one side of the capsule: spores a little smaller and papillose. — Musc. Appal. n. 46; Sulliv. Icon. Musc. Suppl. 22, t. 13. *Ephemerum synoicum*, James, Trans. Am. Phil. Soc. (1865), 106; Sulliv. & Lesq. Musc. Bor.-Am. (2 ed.), n. 27.

Hab. Sides of ditches in clayey ground near Camden, New Jersey, and around Philadelphia (*James*).

2. EPHEMERUM, Hampe.

Pseudo-dicœcious. Flowers gemmiform; female buds gregarious upon the same prothallium. Calyptra campanulate. Capsule globose-ovate, apiculate. Leaves nerved, except in the first species. Plants slightly stouter.

* *Leaves not costate.*

1. **E. serratum,** Hampe. Prothallium dark green: leaves oblong or lanceolate-acuminate, coarsely and irregularly serrate

or subciliate: capsule dark purple, shining. — Linnæa, xii. 552; Muell. Syn. i. 31; Bryol. Eur. t. 1. *Phascum serratum*, Schreb. Phasc. 9, t. 2; Sulliv. Mosses of U. States, 14.

Var. **angustifolium**, Schimp. Leaves narrower, linear-lanceolate, obtusely and distantly serrate: capsule smaller, longer pedicellate, globose-ovate to conical, more distinctly apiculate: spores smaller. — *Ephemerum minutissimum*, Lindb. Manip. Musc. ii. 411.

HAB. Broken fields, on the ground, in winter or early spring. Closter, New Jersey (*Austin*); California (*Bolander*). The variety at Cambridge, Massachusetts (*James*), and at the Carlton House, Saskatchewan (*Drummond*).

* * *Leaves costate.*

2. **E. crassinervium**, Hampe. Leaves long, lanceolate, subulate, flexuous, erect, more or less coarsely and irregularly serrate on the borders toward the apex and on the back of the costa, which is flatter and often disappears at the base, but is continuous to the apex: capsule short-pedicellate: spores large, papillose. — Muell. Syn. i. 33; Sulliv. Icon. Musc. 17, t. 8. *Phascum crassinervium*, Schwaeg. Suppl. i. 4, t. 2; Sulliv. Mosses of U. States, 14.

HAB. Moist clay ground and open fields; common and very variable.

3. **E. spinulosum**, Bruch & Schimp. Differs from the last in the narrow very soft leaves having the costa (loosely areolate and effaced near the base) excurrent into a long soft hyaline spinulose arista, and in the loosely areolate membrane of the capsule. — Schimp. Syn. 6, and Proc. Am. Acad. xiv. 139. *Phascum crassinervium*, var. (?), Sulliv. l. c., 14.

HAB. Same as the preceding.

4. **E. papillosum**, Aust. Closely allied to *E. crassinervium*, differing in the narrower leaves, with equally distant serratures and papillose on both sides, and in the mitriform calyptra, distinctly papillose. — Musc. Appal. n. 50; Sulliv. Icon. Musc. Suppl. 19, t. 10.

HAB. On thin soil, upon rocks; Palisades, New Jersey (*Austin*).

5. **E. hystrix**, Lindb. Plants larger: leaves slightly exceeding the capsule, open-erect or subsecund, rigid, canaliculate-carinate, narrowly lanceolate-subulate, very acute, long-spinulose upon both sides and on the margins; costa thick, not distinctly defined, continuous, nearly filling the subulate point:

capsule sessile, large, globose, very shortly conic-rostellate; calyptra minutely papillose: spores very large, minutely tuberculate. — Manip. Musc. ii. 411. *Phascum serratum*, var. *angustifolium*, Drumm. Musc. Bor.-Am. (Coll. II.) n. 2, in part.

HAB. Louisiana, with *E. spinulosum* (*Drummond*).

This species, like the two preceding, is apparently only a marked variety of the polymorphous and common *E. crassinervium*.

6. **E. cohærens,** Muell. Prothallium thin, yellowish green: leaves ovate or oblong-lanceolate, denticulate above; costa effaced at base, continuous upward to the apex: capsule subglobose with a short obtuse point, purplish brown. — Syn. i. 32; Bryol. Eur. t. 1. *Phascum cohærens*, Hedw. Sp. Musc. 25, t. 1, figs. 1–6; Sulliv. Mosses of U. States, 15.

HAB. Clay banks along streams, common and variable.

7. **E. stenophyllum,** Schimp. Leaves erect, narrowly lanceolate-subulate, serrate or nearly entire at the apex; costa loosely areolate, scarcely distinct except toward the apex where it passes into a short entire point; cells chlorophyllose. — Syn. (1 ed.), 5. *Phascum stenophyllum*, Voit. *E. sessile*, Muell.; Bryol. Eur. t. 2; Sulliv., l. c., 14. *E. pallidum*, Schimp. Syn. (2 ed.), 5; recorded as sent by Sullivant in 1842.

HAB. On clay soil, Ohio; Closter, New Jersey (*Austin*).

2. *Plants with short stems: prothallium none.*

3. PHYSCOMITRELLA, Schimp.

Stems radiculose at base. Leaves spreading or reflexed, narrowly costate, dentate. Capsule thin, soft, globose. Calyptra campanulate, fugacious, vesicular when young.

1. **P. patens,** Schimp.* Plants subcespitose, pale green: stem very short: leaves ovate-lanceolate, the upper obovate-

* APHANOREGMA SERRATUM, Sulliv., differs from this species only in the regular dehiscence of the capsule, which divides in the middle and is therefore considered as operculate or stegocarpous, though no decoloration nor any kind of modification of texture is observable on the line of disruption. But for this regular dehiscence *Aphanoregma* should be described here merely as a variety of *Physcomitrella patens*. It is therefore a remarkable connecting link between the *Ephemereæ* and the *Physcomitrieæ*, which resemble each other also in the areolation of the leaves. It is from these considerations that Lindberg and some other

acuminate, rosulate, serrate above, costate to near the apex: antheridia sessile in the axil of a leaf, or in young plants terminal in the buds and becoming lateral by the growth of the female flower: capsule immersed, or pedicellate and exserted. — Bryol. Eur. t. 3. *Phascum patens*, Hedw. Stirp. Crypt. i. 28, t. 10; Sulliv. Mosses of U. States, 15.

HAB. Wet clayey or sandy ground in bottoms, on the banks of rivers, etc.; not rare in Ohio.

4. SPHÆRANGIUM, Schimp.

Plants gemmiform, very small, gregarious or irregularly loosely cespitose. Lower leaves very small, the upper very large, subconvolute-imbricated or clustered in a small bulb-like head, concave or carinate, costate, minutely papillose on the back or on both sides. Male and female flowers cohering, or rooting as distinct plants. Capsule either short-pedicellate and erect or on a longer slender curved pedicel, spherical, enclosed in the perichætium. Calyptra erect, very small, mitriform. Spores small, subglobose, minutely granulose, brown.

1. **S. muticum,** Schimp. Plant yellowish brown: lower and middle leaves ovate-acuminate, more or less recurved at the apex and mucronate by the excurrent costa; upper leaves two, rarely three, twice as large as the lower, mucronate by the excurrent recurved costa or irregularly erose at the apex: capsule short-pedicellate, erect, slightly mamillate at top, orange. — Syn. Musc. 13. *Phascum muticum*, Schreb. Phasc. t. 1, fig. 11, 12; Sulliv. Mosses of U. States, 15. *Acaulon muticum*, Muell. Syn.; Bryol. Eur. t. 4.

HAB. California (*Bolander*).

2. **S. rufescens.** Plants greenish yellow: lower leaves very small, ecostate, the upper very large, convolute in an

authors include the genus *Ephemerum* as the lowest member of the *Physcomitrieæ*. We have here retained the classification followed by the recent authors whose works are more generally known and more accessible to students, — Schimper, Wilson, Sullivant, etc., — not merely because it has been adopted by all American bryologists, but because it is by far the simplest, and the most serviceable in the study of mosses.

obtusely tetragonal head, deeply concave, cuspidate by the thick excurrent costa, denticulate or erose at the apex: male buds sessile at the base of the fertile ones: capsule on an erect flexuous or arcuate pedicel. — *Acaulon rufescens*, A. Jaeger, Musc. Cleist. 19. *Acaulon triquetrum*, var., Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. (2 ed.), n. 31.

HAB. Very common in the Eastern and Central States.

This species is intermediate between the last and the next following, and so near to both that it is difficult to indicate a constant specific character. The color of the more distinctly triangular perichætium, as well as the occasionally longer and curved pedicel, refers it to *S. triquetrum;* but in the generally short and straight pedicel, the leaves not at all or scarcely revolute on the margin and more distinctly erose-denticulate at the apex, and the bulb-like heads indistinctly triquetrous, it approaches *S. muticum.*

3. **S. triquetrum,** Schimp. Plants pale green or yellowish, distinctly triquetrous: lower leaves small, somewhat nerveless, the middle broadly ovate and costate, and the terminal deeply carinate, reflexed on the margins, minutely erose at the apex, mucronate by the excurrent recurved point of the costa: capsule pendent from a longer arcuate pedicel. — Syn. Musc. 14. *Phascum triquetrum*, Spruce, Engl. Bot. Suppl. t. 2901; Sulliv. Mosses of U. States, 15. *Acaulon triquetrum*, Muell. Syn.; Bryol. Eur., t. 4.

HAB. Open soil; New England (*Ingraham, James*); New Jersey (*Austin*); Santee Canal, South Carolina (*Ravenel*); Saskatchewan (*Drummond*).

4. **S. Schimperianum.** Plants sparsely gregarious, ovoid-bulbiform: leaves closely imbricate, the lower small, ecostate, the upper much larger, deeply concave, recurved at the apex, papillose on both faces, recurved on the margin, erose-dentate in the upper part, the costa appearing below the apex and excurrent into a long point: capsule globose, scarcely mamillate, orange-colored, horizontally inclined by a curve of the somewhat long pedicel. — *Phascum Schimperianum*, Sulliv. Mosses of U. States, 15. *Acaulon Schimperianum*, Sulliv. Icon. Musc. 18, t. 9.

HAB. San Marcos, Texas (*Wright*); Athens, Illinois (*E. Hall*).

5. PHASCUM, Linn., in part. (Pl. 1.)

Plants more robust, distinctly caulescent. Leaves costate; cells of the areolation loose, hexagonal-rectangular and hyaline

on the lower part, more dense, quadrate or round-hexagonal in the upper. Flowers monœcious; the male gemmaceous (in American species), upon the stem at the base of the branches or naked in the axil of a perichætial leaf. Capsule pedicellate, sub-globose or ovate-oblong, apiculate or obtusely rostellate. Calyptra cucullate. Columella persistent.

1. **P. Carniolicum,** Web. & Mohr. Plants minute, cespitulose: stems short, simple or bifid: lower leaves small, lanceolate, the upper and comal long-lanceolate, spreading or erect, incurved, complicate when dry; costa strong, percurrent or excurrent into a short point; areolation chlorophyllose in the upper part: male flowers at the base of the stems: capsule short-pedicellate, subglobose, obtusely pointed, shining, reddish brown. — Bot. Taschenb. 69 and 450; Bryol. Eur. t. 5. *Acaulon Carniolicum*, Muell. Syn. i. 23.

Hab. Silicious soil and stones on the plains of Western Kansas (*E. Hall*).

2. **P. cuspidatum,** Schreb. Plants subcespitose: stems short and simple, or divided by basilar innovations or flagelliform branches: leaves close, shutting up in the gemmules on the short stems or erect-spreading, more or less distant, ovate-lanceolate, the terminal carinate-concave, long-acuminate, cuspidate by the more or less excurrent round costa, very entire, somewhat revolute in the lower part; areolation minutely papillose: capsule on a short straight or slightly curved pedicel, immersed, globose or rarely ovate, obtusely acuminate, reddish brown. — Phasc. 8, t. 1; Bryol. Eur. t. 5.

Var. **piliferum,** Bruch & Schimp. Costa prolonged into a long filiform point: capsule larger; pedicel generally curved. — *P. piliferum*, Schreb., l. c., t. 1, fig. 7.

Hab. Dry soil in old fields, on the borders of meadows, along fences, etc. Both the normal form and the variety are very common. Other varieties are enumerated by European authors, but are easily referred to the type.

3. **P. bryoides,** Dicks. Loosely cespitose or occasionally densely tufted, the plants short, prostrate when old; innovations basilar: leaves small, distant, ovate-lanceolate, the upper oblong-lanceolate, cuspidate by the excurrent costa, concave, entire and margins recurved: calyptra large, yellowish, reaching the middle of the capsule: capsule emerging on a long thick

pedicel, oval or oblong, slightly incurved, gradually narrowed into an obtuse beak, brown. — Crypt. fasc. 4, t. 10, fig. 3; Bryol. Eur. t. 6. *P. gymnostomoides*, Brid. Bryol. Univ. i. 48. *Pottia bryoides*, Lindb. Trichost. 10.

HAB. On the south side of a hill near Oakland, California (*Bolander*); very rare in the United States.

6. PLEURIDIUM, Brid.

Plants annual, or persisting by innovations from the apex after the maturing of the fruit. Leaves oblong at base, lanceolate-subulate, obtusely serrate at the apex, costate, the upper tufted. Calyptra cucullate. Capsule ovate-globose or ovate-apiculate, smooth, shining, short-pedicellate. — *Phascum*, Linn. and authors, in part.

* *Flowers bisexual.*

1. **P. subulatum,** Bruch & Schimp. Plants cespitose, yellowish green: lower leaves ovate-lanceolate, erect, the upper lanceolate-subulate, erect-spreading or subsecund, much exceeding the top of the capsule; costa broad, reaching to the obscurely serrate apex: antheridia naked in the axils of perichætial leaves: capsule globose-ovate, apiculate. — Bryol. Eur. t. 9. *Phascum subulatum*, Schreb.; Sulliv. Mosses of U. States, 16.

Var. **stramineum,** Lesq. Plants pale yellow; stems with long slender flagelliform innovations and short distant leaves; comal leaves more abruptly narrowed at the apex. — *Pleuridium stramineum*, Sulliv. & Lesq.; Austin, Bull. Torr. Club, vi. 142. *P. subulatum*, Lesq. Trans. Am. Phil. Soc. xiii. 2. *P. subulatum*, var., Watson, Bot. Calif. ii. 359.

HAB. Dry hills and old fields; rare. Pennsylvania (*James*); California (*Bolander*).

The variety was at first admitted as a species and figured for a plate of Sullivant's *Icones*. It is intermediate between the typical form and the following.

2. **P. Ravenelii,** Aust. Differs from the last in its shorter stems, the comal leaves broader, lanceolate or ovate-oblong in the lower part, carinate, the costa excurrent into a more or less elongated smooth awl-shaped point, the capsule a little larger and broadly apiculate. — Bull. Torr. Club, vi. 142.

HAB. Light sandy soil. South Carolina (*Ravenel*); New Jersey and New England (*Austin, Bennett, Jesup*).

* * *Flowers monœcious; male plants gemmiform, axillary.*

3. **P. alternifolium,** Brid., in part. Plants cespitose, at first simple and erect, after a year becoming prostrate and branching in long flagelliform innovations: comal leaves enlarged at the ovate base, abruptly narrowed into a slender awl-shaped slightly serrulate point, filled by the stout excurrent costa: capsule ovate or subglobose, obliquely apiculate: calyptra split to near the acuminate apex. — Bryol. Eur. t. 10. *Phascum alternifolium*, Sulliv. Mosses of U. States, 15.

Var. **Lancastriense,** Sulliv. & Lesq. Leaves longer; areolation more dense: capsule more obtuse: spores larger. — Musc. Bor.-Am. Exsicc. (ed. 1), n. 30.

Var. **robustum,** Sulliv. & Lesq. Plants twice as long as in the common form: comal leaves shorter: spores large. — Same, n. 31. *Archidium Lescurii*, Aust. Bull. Torr. Club, vi. 144.

Hab. Open fields, on sandy and clayey ground; very common.

The first variety at Lancaster, Ohio, with *Bruchia Sullivantii;* the last on the Raccoon Mountains, Alabama, in humid depressions on sandstone rocks, with *Bruchia Sullivantii*, var. *nigricans* (*Lesquereux*).

4. **P. Sullivantii,** Aust. Plants gregarious: stems rigid, julaceous; innovations filiform, nearly as long as the stems: leaves closely imbricate and appressed, the lower ovate-mucronate, denticulate, the upper enlarged, longer pointed, obscurely serrate; perichætial leaves much longer, oblong-ovate, abruptly cuspidate, erose-serrate above; costa thick, percurrent or excurrent: capsule large, round-ovate, short-pedicellate, obtusely mamillate; calyptra large, campanulate, obtusely acuminate. — Bull. Torr. Club, vi. 142. *Phascum nervosum*, Drumm. Coll. n. 6; Sulliv. Mosses of U. States, 16. *Pleuridium nervosum*, Sulliv. Icon. Musc. 19, t. 10.

Hab. Pennsylvania (*Drummond*); South Carolina, on light sandy soil (*Ravenel*). *Phascum nervosum*, Hook., a species of the Cape of Good Hope, is evidently different.

5. **P. Bolanderi,** Muell. Leaves long-lanceolate and subulate, minutely denticulate from the middle upward, with a pale excurrent costa: capsule ovate, obliquely apiculate, short-pedicellate; calyptra dimidiate, often split, blackened at the apex. — Jaeger, Musc. Cleist. 32.

Hab. Near San Francisco, California (*Bolander*).

Distinguished from other species of the genus by the leaves obscurely serrulate from the middle upward, by the pale costa, the short-pedicellate capsule, and the top of the calyptra appearing as if burned.

7. MICROBRYUM, Schimp.

Plants very small, gregarious or subcespitose, gemmiform. Leaves more closely areolate, strongly costate, minutely papillose on the back. Flowers monœcious: antheridia very small in the axils of the comal leaves. Capsule ovate, obtusely apiculate, erect upon a short pedicel. Calyptra reaching to the middle of the capsule, plurilobate, split on one side.

1. **M. Flœrkeanum**, Schimp. Leaves open, erect, slightly curved back at the top; the lower small, ovate-apiculate, costate to the middle, more densely areolate; the upper broadly ovate, mucronate by the stiff brown sharp point of the excurrent costa; cells of the areolation at base loose and hyaline, in the upper part small, yellowish-chlorophyllose. — Syn. Musc. 11. *Phascum Flœrkeanum*, Web. & Mohr; Schwaegr. Suppl. i. 3, t. 3. *Acaulon Flœrkeanum*, Muell.; Bryol. Eur. t. 3.

HAB. Very rare; found in Illinois by *E. Hall*, a few plants only, mixed with *Pottia subsessilis*.

8. BRUCHIA, Schwaegr. (Pl. 1.)

Plants gregarious, short, simple or sparingly dichotomous. Stem-leaves small, distant, the upper and comal crowded, much longer, all costate to the apex; basilar areolation hexagonal-rectangular, narrower upward. Capsule with a long solid collum (without collum in *B. palustris*), oval, rostellate, emerging on a more or less elongated pedicel. Calyptra thin, lobate or lacerate at base, mitriform.

1. **B. palustris**, Muell. Hypogynous: plants cespitose: lower leaves distant, ovate-lanceolate, narrowly costate; the upper and comal much longer, abruptly narrowly subulate from a lanceolate base; costa stout, excurrent into a long semi-cylindrical awn: antheridia naked in the axils of perichætial leaves: capsule rather large, ovate-acuminate, pale yellow. — Syn. i. 19. *Pleuridium palustre*, Bryol. Eur. t. 10. *Phascum palustre*, Sulliv. Mosses of U. States, 16. *Sporledera palustris*, Schimp.

HAB. Sandy soil; rare. Louisiana (*Drummond*); Burlington, New Jersey (*James*).

2. **B. flexuosa,** Muell. Stems comparatively long, curved downward at base: stem-leaves distant, very small, narrowly lanceolate-subulate, obscurely serrate at the apex: flowers monœcious or parœcious; antheridia in the axils of comal leaves or in separate buds. — Bot. Zeit. v. 99. *Phascum flexuosum*, Schwaegr. Suppl. ii. 1, t. 101.

Var. **microcarpa,** Wils. Very slender: leaves very narrowly subulate, the entire margin obscurely serrulate: capsule narrow, longer apiculate, long-pedicellate. — *B. microcarpa*, Wils.; Drumm. Musc. Amer. (Coll. II.), n. 14. *Sporledera setifolia*, Jaeger, Musc. Cleist. 35.

Hab. Clayey ground in fields, mixed with the following.

3. **B. Sullivantii,** Aust. Similar to the last, differing merely in the short stems and narrowly ovate-lanceolate leaves, the upper somewhat longer and elongated lanceolate-subulate, subpapillose, the areolation more compact and texture more solid. — Bull. Torr. Club, vi. 143. *B. flexuosa*, Sulliv. Icon. Musc. 22 (excl. descr.), t. 13.

Var. **nigricans.** Leaves shorter: capsule with a shorter collum: spores larger. — *B. flexuosa*, var. *nigricans*, Sulliv. Mosses of U. States, 17; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. n. 33. *B. nigricans*, Austin, l. c.

Hab. With the preceding; the variety on borders of depressions filled with water and *Confervæ* at the top of the Raccoon Mountains, Alabama (*Lesquereux*).

The variety is evidently due to immersion, as higher upon the dry sand of the borders of the depressions the moss gradually assumes its normal form.

4. **B. Bolanderi,** Lesq. Monœcious, densely gregarious or subcespitose, pale green: stem-leaves distant, lanceolate, the comal erect-spreading, short-subulate from the lanceolate slightly enlarged base; costa broad, flat, vanishing below the obtusely serrulate apex; perichætial leaves tubulose, narrowly lanceolate from the middle: male flowers in separate buds upon the primary prostrate stems: capsule erect or slightly oblique, long-necked, upon a long flexuous thick pedicel; calyptra short, split to the middle on one side. — Mem. Calif. Acad. i. 5; Sulliv. Icon. Musc. Suppl. 23, t. 14.

Hab. Westfall's Meadow, near Bigtree Grove, Mariposa County, California, at 8,000 feet altitude (*Bolander*).

The species is allied to the European *B. Vogesiaca*, Schwaegr., differing

especially in the shorter leaves, the perichætial longer and more or less tubulose, in the short beak and collum of the capsule, the thick pedicel, etc.

5. **B. Beyrichiana,** Muell. Stems short, simple: leaves curved when dry, open-erect when moist, those of the stem narrowly lanceolate, the comal gradually long-subulate from the enlarged base, obscurely serrulate at the apex: flowers parœcious: capsule solid, oblong, with a short indistinct collum, subimmersed, its top not surpassing the leaves; pedicel short, flexuous; calyptra large, broadly laciniate, covering the capsule to its base. — Bot. Zeit. v. 99; Sulliv. Icon. Musc. Suppl. 25, t. 15, partly made upon specimens of the next species. *Sporledera Beyrichiana*, Hampe, Linnæa, xi. 279. *Phascum Beyrichianum*, Schwaegr. Suppl. iv. t. 301.

HAB. First found near Baltimore by *Beyrich;* Burlington, New Jersey (*James*); Illinois (*Vasey*).

6. **B. brevicollis,** Lesq. & James. Differing from the last in the longer-pedicellate emergent broadly oval capsule, with a distinct collum defluent into the pedicel, in the shorter apiculate calyptra reaching to the collum, and in the shorter leaves, broader at base, and narrowed into a long entire awl-shaped point entirely filled by the enlarged costa. — Proc. Am. Acad. xiv. 135.

HAB. Santee Canal, South Carolina (*Ravenel*).

7. **B. curviseta.** Plants short: lower leaves small, lanceolate, the upper much longer, narrowly subulate from a short broadly ovate base, denticulate at and near the apex; costa stout, filling the awl-shaped canaliculate point: flowers monœcious: capsule emergent, ovate, with a distinct collum, abruptly narrowed or truncate upon a somewhat long pedicel, which is geniculate or abruptly curved in the middle; lid short, acuminate; calyptra large, covering the capsule to below the middle, smooth. — *B. Vogesiaca*, var. 2, Hook. & Wilson, Drumm. Musc. Amer. (Coll. II.), n. 15, in part.

HAB. Louisiana, near New Orleans (*Drummond*).

Compared with *B. brevicollis* it differs in the leaves distinctly denticulate above, in the larger and shorter calyptra, the capsule truncate at base, and the longer geniculate pedicel.

8. **B. Hallii,** Aust. Plants small, gregarious, yellowish green: stem ½ cent. long, slender, filiform: lower leaves small, closely appressed, broadly ovate-acuminate, the upper longer,

oblong or obovate at base, more gradually acuminate, all very entire, glossy; costa enlarged upward, somewhat excurrent: capsule exserted, pyriform-elliptical, somewhat long-beaked, the comparatively long collum gradually narrowed to the long straight pedicel; calyptra smooth, mitriform or subcucullate, lobed, covering a third of the capsule. — Bull. Torr. Club, v. 21.

HAB. Near Houston, Texas (*E. Hall*).

A very fine and distinct species, recognized at once by its short appressed imbricate leaves, and the capsule exserted on a long straight pedicel.

9. **B. Donnellii,** Aust. Paræcious, of the size of *B. flexuosa:* leaves more abruptly subulate from a nearly round base, distinctly papillose: pedicel more strict: capsule 2-colored, with a thicker and longer collum: spores nearly twice as large. — Bull. Torr. Club, vi. 144.

HAB. Florida (*J. Donnell Smith*).

This species has a long thick collum and large spores, as in *B. Texana,* which, however, has much shorter smooth leaves. It also has the inflorescence and large spores of *B. Hallii,* but the collum in this last species is much shorter and the leaves are smooth. — (*Austin*).

10. **B. Texana,** Aust. Compared with the preceding it differs in the shorter stems; the lower leaves narrower, longer-lanceolate-acuminate and flexuous, the upper much longer, oval at base, abruptly narrowed and very narrowly subulate-canalic, ulate upward, flexuous when dry; costa dilated upward, percurrent; areolation longer and narrower below, rapidly passing above to very small minutely granulose cells: capsule a little shorter, with a more slender beak and a thicker collum abruptly narrowed to the pedicel. — Bull. Torr. Club, v. 21.

HAB. Near Houston, Texas (*E. Hall*).

11. **B. brevipes,** Hook. Resembling *B. flexuosa* in aspect, but distinguished by its small size, the rigid leaves more enlarged at base, abruptly narrowed into a longer awl-shaped point entirely filled by the costa, by the shorter pyriform immersed capsule truncate at base and sharply apiculate, by the very short pedicel, and larger spores. — Icon. Pl. t. 231; Hook. & Wils., Drumm. Musc. Amer. (Coll. II.), n. 15, in part; Sulliv. Icon. Musc. 24, t. 14.

HAB. Louisiana (*Drummond*); South Carolina, on sandy ground (*Ravenel*); Petersburg, Virginia (*James*).

12. **B. brevifolia,** Sulliv. Subcespitose, the stems very short, erect, densely foliate: lower leaves minute, ovate-acumi-

nate, the upper comparatively short, scarcely reaching to the middle of the capsule, large, ovate and clasping at base, abruptly narrowed into a broad blunt point; costa flat, broad, percurrent: flowers monœcious; male buds terminal: capsule very large for the size of the plant, obovate-oblong, truncate at base, abruptly acuminate; pedicel very short; calyptra scarcely covering a third of the capsule. — Mosses of U. States, 17, and Icon. Musc. 25, t. 15. *B. Vogesiaca*, var. 2, Hook. & Wils., Drumm. Musc. Amer. (Coll. II.), n. 15, in part.

Hab. Louisiana (*Drummond*); sandy ground on the Santee Canal, South Carolina (*Ravenel*).

13. **B. Ravenelii,** Wils. Plants very small (the smallest of the genus), closely gregarious: leaves close together, the lower minute, the middle linear-lanceolate and erect, the upper much longer, spreading, lanceolate, gradually narrowed to a denticulate apex; costa broad, percurrent: flowers monœcious: capsule nearly immersed, short, obovate and apiculate, its scarcely distinct short collum abruptly narrowed into the very short pedicel; calyptra distinctly and sometimes profusely papillose. — Sulliv. Mosses of U. States, 17, and Icon. Musc. 26, t. 16.

Var. **mollis.** Calyptra less papillose; capsule with a slightly more marked collum: leaves shorter, not exceeding the capsule. — *B. Carolinicæ*, Austin, Bull. Torr. Club, vi. 144.

Hab. Banks of the Santee Canal, South Carolina (*Ravenel*); the variety in Florida (*J. Donnell Smith*).

14. **B. Hampeana,** Muell. Leaves enlarged at base, narrowed and subulate above, the entire margin obscurely denticulate: capsule obovate, with a moderately long collum; calyptra laciniate at base, distinctly papillose vesiculose. — Syn. i. 18. *Sporledera Schwaegricheni*, Hampe in litt.

Hab. Louisiana (*Drummond*).

Differing from the last especially in the distinct somewhat long neck of the capsule.

3. *Plants with branching and prostrate stems. Calyptra adherent to the capsule. Spores remarkably large and few.*

9. ARCHIDIUM, Brid. (Pl. 1.)

Plants small, branching by short and erect or by long prostrate innovations. Leaves linear-lanceolate or ovate-lanceolate,

costate; areolation loose, uniform, hexagonal-rhomboidal, slightly chlorophyllose. Flowers monœcious, gemmiform. Calyptra very thin, irregularly lacerate. Capsule globose, sessile. Spores few, larger than in any other moss, $\frac{1}{4}$ m.m. in diameter, smooth.

1. **A. Ohioense,** Schimp. Monœcious: stems filiform: leaves spreading, subulate by the excurrent costa, serrulate above; perichætial leaves broadly lanceolate, narrowed into a long point, costate: capsule globose, on short lateral branches: spores 16 to 20, angular, smooth. — Bryol. Eur. Arch. 3; Sulliv. Mosses of U. States, 14, and Icon. Musc. 16, t. 7; Sulliv. & Lesq. Musc. Bor.-Am. Exsice. n. 28. *A. phascoides*, Sulliv. Musc. Allegh. n. 213.

Var. **Donnellii.** More robust, yellowish green: leaves thin, subscarious; areolation less distinct: male flowers more generally terminal. — *A. Donnellii*, Austin, Bull. Torr. Club, vi. 190.

Hab. Meadows and waste fields, Central Ohio and Northern Alabama. The variety in Florida (*J. Donnell Smith*).

2. **A. tenerrimum,** Mitten. Differing from the last, especially in the hypogynous inflorescence, the antheridia being placed in the axils of one or two small leaves at the base of the perichætial ones, as in the European *A. phascoides*, Brid.; the cells of the areolation are much shorter, closer and firm. — Journ. Linn. Soc. viii. 17. *A. phascoides*, Drumm. Musc. Am. (Coll. II.), n. 11.

Hab. Louisiana (*Drummond*).

3. **A. Ravenelii,** Aust. Synœcious: plants much divided below: lower leaves distant, very small, ovate and appressed, or larger and open, the upper closely imbricate-tufted or pressed together in gemmules, ovate-lanceolate, distinctly acuminate or acute or obtuse, very entire; costa vanishing below the apex or excurrent into a short point; areolation very loose, round, oval or rhomboidal, slightly longer and broader toward the base. — Bull. Torr. Club, vi. 145.

Hab. South Carolina (*Ravenel*); Florida (*J. Donnell Smith*).

4. **A. longifolium,** Lesq. & James. Synœcious: cespitose, sometimes in compact tufts, yellowish green; stems short, slender: leaves long and narrow, open, flexuous, narrowly lanceolate-subulate; areolation in long quadrangular cells, be-

coming shorter and nearly quadrate at base; costa stout, excurrent into a smooth awl-shaped point: male flowers in the axils of perichætial leaves. — Proc. Am. Acad. xiv. 134.

Hab. Florida (*Garber*), in fine copiously fruiting specimens.

5. **A. Hallii,** Aust. Monœcious, the male flowers terminal on a distinct branch: leaves with a very loose areolation and the margins often obscurely recurved; costa often long-excurrent. — Bull. Torr. Club, vi. 145.

Hab. Texas (*E. Hall*). This species is not satisfactorily known.

B. STEGOCARPI. — Capsules opening in the upper part by a dehiscent lid.

Tribe II. WEISIEÆ.

Plants cespitose, sometimes very small, generally of medium size. Leaves simply costate; areolation opaque, composed of parenchymatous cells, small, punctiform or quadrate and generally papillose in the upper part of the leaf, larger, oblong-hexagonal and pellucid or chlorophyllose at the enlarged base. Capsule solid, generally exserted upon a more or less elongated pedicel, rarely immersed, erect or curved, sometimes inclined or pendent, subcylindrical, with a short collum or none. Lid rostrate. Peristome simple or none; teeth flat, entire or bifid. Calyptra cucullate.

1. *Peristome none.*

10. ASTOMUM, Hampe.

Plants small, simple or branching. Upper leaves longer, tufted, linear-lanceolate, curling. Flowers monœcious. Capsule erect, symmetrical; lid distinctly formed but not easily detached. — *Systegium*, Schimp.

1. **A. crispum,** Hampe. Stems short, branching: lower leaves very small, narrowly ovate, the upper linear-lanceolate, densely tufted, minutely papillose on the back, crispate when dry; costa round, excurrent into a short point, borders involute: capsule globose, short-pedicellate, immersed; lid short-

conical, acute. — Linnæa, xii. 552; Bryol. Eur. t. 12. *Phascum crispum*, Hedw. Stirp. Musc. Frond. i. 25, t. 9; Sulliv. Mosses of U. States, 16.

HAB. Bare sandy soil under bushes, Vincennes, Ind. (*Lesquereux*); Texas (*Wright*), imperfect specimens; Pennsylvania (*James*). Rare.

2. **A. Ludovicianum,** Sulliv. Differs from the last in its stronger and more divided habit, the capsules more numerous, often clustered 2 or 3 in the same perichætium, oblong-oval, with a more elongated obtuse lid. — Icon. Musc. 21, t. 12. *Phascum crispum*, var. *rostellatum*, Hook. & Wils., Drumm. Musc. Am. (Coll. II.), n. 10. *P. Ludovicianum*, Sulliv. Mosses U. States, 16. *Systegium erythrostegium*, Schimp. Proc. Am. Acad. xiv. 140.

HAB. Near New Orleans (*Drummond*); Florida (*Chapman*).

3. **A. Sullivantii,** Schimp. Closely resembles *A. crispum*, differing in the plants being smaller, more slender and generally simple, the capsule smaller, bright orange with a slightly longer-beaked lid, and a shorter calyptra. — Bryol. Eur. Astom. 2; Sulliv. Icon. Musc. 20, t. 11. *Phascum crispum*, Sulliv. Musc. Allegh. n. 211, in part. *P. Sullivantii*, Sulliv. Mosses of U. States, 16.

HAB. Commonly found in meadows, especially in new clover fields.

4. **A. nitidulum,** Schimp. Plants much smaller and less branched than in the last: leaves shorter, open, scarcely convolute when moistened: capsule ovoid, shining, chestnut-color; lid obliquely rostellate: calyptra short, scarcely reaching the base of the lid. — Bryol. Eur. Astom. 3; Sulliv. & Lesq. Musc. Bor.-Am. n. 36. *Phascum nitidulum*, Muell.; Sulliv. Mosses of U. States, 16.

Var. **pygmæum,** Lesq. Plants minute, much divided: costa simply percurrent, not passing above the apex: capsule oval, orange-colored: lid straight, obtusely beaked.

HAB. On the naked ground in meadows, often found with the preceding; Central Ohio.

11. GYMNOSTOMUM, Hedw. (Pl. 1.)

Plants cespitose. Stems slender; branches dichotomous or fasciculate. Leaves small, gradually larger upwards and tufted at the apex, lanceolate or linear-lanceolate, concave or canalic-

ulate by a solid costa, prominent on the back; areolation minute, quadrate in the upper part. Flowers dicœcious in the American species. Capsule symmetrical; lid long-beaked.

1. **G. calcareum,** Nees & Hornsch. Plants densely tufted, green above, ferruginous below; stems radiculose: lower leaves very small, gradually or abruptly larger upward, linear-lanceolate, costate to near the blunt apex, concave, borders minutely crenulate; lower perichætial leaves sheathing, the upper spreading, very concave, lanceolate-acute: capsule exserted on a comparatively long pedicel, oblong, yellowish brown, truncate or slightly constricted under the orifice when dry; annulus short, persistent; lid subulate-rostrate from a conical base. — Bryol. Germ. 153, t. 10; Bryol. Eur. t. 32. *Trichostomum calcareum,* Lindb. Trichost. 19.

Var. **brevifolium,** Schimp. Plants slender and delicate: lower leaves distant, very small, scarcely perceivable to the naked eye, the upper close and tufted, oblong-lanceolate, recurved from the middle, acute or blunt at the apex: capsule small, ovate or sub-globose. — *G. viridulum,* Bryol. Eur. t. 31.

Var. **perpusillum,** Sulliv. Very small. Leaves erect, ovate-lanceolate: capsule pyriform-oval. — Pacif. R. Rep. iv. 185.

Hab. On slate rocks, near Little Falls, New York (*Austin*); the first variety near Belleville, Canada West (*Macoun*), the second on clayey soil near San Francisco, California (*Bigelow*).

2. **G. rupestre,** Schwaegr. More or less densely tufted: stems 1 to 5 cent. long, slender, with dichotomous or fasciculate divisions: leaves gradually increasing in size from the base to the top, spreading or recurved, linear-lanceolate, blunt at apex, minutely papillose on the back or smooth, costate to below the apex; perichætial leaves enlarged at base, somewhat sheathing: capsule ovate-oblong, rarely sub-globose, thin-walled, pale yellow or reddish brown, shining, truncate when empty; pedicel reddish; lid conical-acuminate or short-beaked; annulus none. — Suppl. I., part 1, 31, t. xi.; Bryol. Eur. t. 33, 34. *Trichostomum æruginosum,* Lindb. Trichost. 19.

Var. **stelligerum,** Schimp. Loosely cespitose, more robust: leaves longer, incurved when dry: capsule pale, reddish at the orifice; lid obliquely rostrate. Closely resembles the following. —*G. tophaceum,* Austin, Bull. Torr. Club. vi. 42.

Hab. Surface and fissures of damp or shaded overhanging rocks, in the mountains especially, not rare. The variety on calcareous rocks, Dallas County, Texas (*E. Hall*).

This and the next species are extremely variable, and some of the varieties are indifferently referable to one or the other. Var. *stelligerum*, which represents *G. stelligerum* and *G. articulatum*, Smith, and *G. pomiferum*, Nees & Hornsch., is considered by Wilson and others as a variety of *G. curvirostrum*. It is apparently from sterile plants of one of the numerous varieties of this species that *G. Clintoni*, Aust. (Bull. Torr. Club, vi. 42), has been made.

3. **G. curvirostrum**, Hedw. Plants dark red or brown, soft or solid, 1 to 10 cent. long, with close fastigiate branches more or less covered with a reddish felt of radicles: leaves spreading, slightly incurved when dry, lanceolate-acute, concave at the hyaline base, carinate above, smooth or slightly papillose, with borders entire or sometimes slightly serrate and recurved above the base; costa vanishing under the apex: capsule long-pedicellate, ovate, oblong or sub-globose, thick-walled, chestnut-color, shining, turbinate when dry and empty; lid enlarged and conical at base, prolonged into a long oblique tubular beak remaining attached to the columella and persisting long after disruption from the orifice of the capsule; annulus of a double row of small persistent cells: spores larger than in the preceding. — Stirp. Crypt. ii. 68, t. 24; Bryol. Eur. t. 35 and 36. *Pottia curvirostris*, Ehrh.

Hab. Limestone rocks, and on deposits of carbonate of lime or tufa, near springs; very abundant at Niagara Falls.

4. **G. tenue**, Schrader. Plants very small, 1 m.m. high, widely subcespitose: leaves linear, gradually narrower to the obtuse apex, concave; perichætial leaves sheathing to the middle, there recurved, thinly costate, the inner ecostate and smaller: capsule oblong-elliptical; lid short-beaked; annulus broad; peristome mostly none or composed of minute narrow teeth. — Coll. Pl. Crypt. n. 31; Bryol. Eur. t. 30. *Gyroweisia tenuis*, Schimp. Syn. 2 ed., 38. *Weisia tenuis*, Muell.

Hab. On limestone rocks, Lake Winnipeg (*Drummond*).

12. ANŒCTANGIUM, Schwaegr. (in part).

Plants compactedly pulvinate-cespitose, with dichotomous and fastigiate branches, radiculose their whole length. Leaves spreading, lanceolate or linear-lanceolate, subulate, opaque,

densely papillose, with a round costa. Flowers monœcious. Capsule erect, oval or sub-globose, with a short inflated collum, smooth, of thin texture; lid obliquely long-beaked; annulus very narrow. Spores small.

A strange genus (*genus paradoxum*, as Schimper calls it), with the dichotomous fastigiate ramification of the *Pleurocarpi*, but a true *Gymnostomum* in the shape of the leaves, their areolation, and the organization of the capsule.

1. **A. Peckii**, Sulliv. Resembling *A. compactum*, Schwaegr., the essential characters of which are indicated in the description of the genus, differing merely in the great size of the plants, the much longer narrowly lanceolate leaves gradually increasing in length upward, subulate-pointed, slightly contracted above the short concave ovate clasping base, carinate-plicate above; areolation more distinctly quadrangular in the upper part of the leaves and chlorophyllose at the base; fruit unknown. — Aust. Musc. Appal. n. 64, and Icon. Musc. Suppl. 38, t. 25.

Hab. Under overhanging rocks, Catskill Mountains, New York (*C. H. Peck*).

2. *Peristome simple.*

13. WEISIA, Hedw. (Pl. 1.)

Mosses of small size, cespitose or pulvinate. Leaves lanceolate or linear-lanceolate and subulate, twisted when dry. Flowers monœcious or diœcious, rarely synœcious. Capsule long-pedicellate, erect, oval-oblong, symmetrical or rarely slightly incurved, with a peristome of 16 more or less perfect lanceolate teeth, either entire or perforated or split at the apex, or to the middle, solid, transversely articulate, granulose, slightly marked with a vertical divisural line. Spores large, verrucose.

1. **W. viridula**, Brid. Monœcious. Plants more or less densely cespitose and pulvinate, bright green: stems about ½ cent. long, nearly simple or with fastigiate branches: lower leaves minute, the upper abruptly much longer, open and flexuous, crispate when dry, linear-lanceolate, mucronate by the stout excurrent costa, enlarged at the pale concave and flat-margined base, tubulose in the upper part by the involute

borders: calyptra reaching to the middle of the capsule: capsule oval-oblong, of thick texture, slightly constricted under the orifice, wrinkled lengthwise when dry, light brown; pedicel twisted to the right; lid long-beaked, straight or bent obliquely; teeth very variable, linear-lanceolate, broad or narrow, often truncate or bifid at the apex with two to five articulations, sometimes merely rudimentary and scarcely distinguishable; annulus narrow, persistent. — Bryol. Univ. i. 334; Bryol. Eur. t. 21. *W. controversa* and *W. microdonta*, Hedw.

Var. **stenocarpa**, Muell. Capsule narrower, subcylindrical, thin-walled, substriate, greenish brown; lid long-beaked, cernuous or curved; teeth nearly entire.

Var. **densifolia**, Muell. Plants larger, more densely cespitose: leaves crowded, narrower; teeth imperfect.

Var. **amblyodon**, Muell. Leaves shorter and broader: teeth truncate, very short or scarcely perceivable, pale. — *W. gymnostomoides* and *W. microstoma*, Nees & Hornsch. *W. Brandegei*, Austin, Bull. Torr. Club, vi. 46.

Var. **gymnostomoides**, Muell. Plants small: leaves shorter than in the normal form: capsule small, elliptical; teeth rudimentary, scarcely visible. — *W. gymnostomoides*, Brid. *Hymenostomum microstomum*, Austin, Musc. Appal. n. 63. *Gymnostomum Rauanum*, Austin, Bull. Torr. Club, v. 21.

Hab. On the ground in meadows, broken fields, borders of ditches, clay banks, etc.; var. *stenocarpa* in Arkansas (*F. L. Harvey*); var. *amblyodon* in Colorado, (*Brandegee*); the last variety near Bethlehem, Pennsylvania (*E. A. Rau, F. Wolle*), on rocky ground, Palisades of New Jersey (*Austin*), New England (*James*).

The most common, most variable, illusive and ambiguous species. Among the numerous forms which have been at different times considered and described as specific, those described above are the more distinct. To the var. *gymnostomoides* are to be referred all the specimens that have been communicated under the generic name *Hymenostomum*, which genus is not yet known from North America.

2. **W. longiseta**, Lesq. & James. Much like the last in the characters of the leaves, it differs in the dicœcious inflorescence, the numerous male plants with gemmiform polyphyllous aggregate flowers, the small curved ovate 8-sulcate capsule on a long, very slender, pale yellow pedicel, the teeth of the peristome large, perfect, linear-lanceolate, lacunose along the divisural line, regularly bifid, spreading when dry, and the spores large and ferruginous. — Proc. Am. Acad. xiv. 136. *W. viridula*,

var. *australis*, Aust. Musc. Appal. Suppl. n. 466, and Bull. Torr. Club, vii. 4.

HAB. On the ground, Enterprise, Florida (*W. A. Fosier, Austin*).

The pale green color of the plants, the long slender yellowish pedicel, the curved capsule, and the large perforated or split teeth give to this species the appearance of a *Dicranum*.

3. **W. Wolfii.** Differs from the preceding in the generally larger leaves, nearly exactly tubulose in the upper part, and curved back when moistened, in the short pedicel of the cylindrical oblong capsule, which is not sulcate nor constricted under the orifice when dry, and in the truncate teeth.

HAB. On the ground near Canton, Illinois (*S. Wolf*).

The dicœcious inflorescence especially separates this species from *W. viridula*, var. *stenocarpa*, and also from *W. mucronulata*, Schimp., which it resembles in the form of the leaves and in the peristome.

14. DICRANOWEISIA, Lindb.

Plants of larger size; branches fastigiate. Perichætium distinct, sheathing. Peristome more perfect; teeth lanceolate, distinctly articulate, entire or bifid at the apex. Flowers monœcious.

1. **D. crispula,** Lindb. Plants pulvinate, rarely cespitose, yellowish or dark green; stems slender, 2 c. m. long or more: leaves enlarged at the concave base, long-subulate and nearly tubulose in the upper part, costate to below the apex, open, falcate-secund, much crispate when dry; basilar cells narrowly rectangular, enlarged, quadrate and yellow at the angles; perichætial leaves short, tubulose, obtuse, sheathing to near the apex: capsule long-pedicellate, of thin texture, oblong-ovate, rugose, constricted under the orifice when dry; lid obliquely subulate-rostrate; teeth of the peristome free to below the orifice of the capsule, narrowly lanceolate, entire or split at the apex; annulus none. — Lindb. in Milde, Bryol. Siles. 47. *Weisia crispula*, Hedw. Spec. Musc., 68, t. 12; Bryol. Eur. t. 26.

HAB. On decayed trunks, California (*Bolander*); Rocky Mountains (*E. Hall, Downie*); Utah (*Watson*); Oregon (*Nevius*).

2. **D. cirrhata,** Lindb., l. c. Plants much divided, ferruginous in the lower part, bright green above: leaves open, curved up from the middle, the lower short, lanceolate, the upper much longer, ovate-concave at base, linear-lanceolate, carinate and re-

flexed on the borders in the upper part, obtusely pointed, soft, cirrhate-crispate when dry; alar cells gradually larger: capsule oblong or subcylindrical, reddish at the orifice; lid subulate-rostrate; teeth linear-lanceolate, entire at the minutely punctulate apex; annulus of three rows of small cells, persistent. — *Weisia cirrhata*, Hedw. Spec. Musc. 69, t. 12; Bryol. Eur. t. 25.

Hab. On rocks, boulders, roots of trees and decayed wood, Coast Ranges, California, and Oregon, very common; near Athens, Illinois (*E. Hall*), sterile plants, perhaps representing a variety.

The species is distinguished from the preceding by the shorter leaves not as narrowly and long-subulate to the apex, reflexed on the borders, the longer and narrower capsule, the compound annulus, the entire teeth, etc.

15. OREOWEISIA, Schimp.

Plants pulvinate. Leaves soft, coarsely papillose and minutely serrulate above; basilar areolation hyaline, the upper chlorophyllose. Perichætium not sheathing. Capsule more or less curved. Inflorescence and peristome of *Dicranoweisia.*

1. **O. serrulata**, Schimp. Densely pulvinate-cespitose; plants radiculose below: leaves crowded, narrowly lanceolate, enlarged and concave to the middle, the perichætial longer, all flexuous, open or incurved, carinate above, costate to below the somewhat obtuse apex: capsule of thick texture, oblong, short-necked; pedicel whitish; lid with a short blunt inclined beak; teeth of the peristome dark orange in the lower part, pale above, abruptly lanceolate-subulate from the enlarged base, entire, perforated or bifid, prominently articulate, flexuous at the apex; annulus none. — Syn. Musc., (2 ed.), 57. *Weisia serrulata*, Funck; Brid., Bryol. Univ. i. 804; Bryol. Eur. t. 27.

Hab. Narrowville, Pennsylvania (*James*); Palisades of New Jersey (*Austin*), sterile; Nulato, Alaska (*Rothrock*), fertile.

16. RHABDOWEISIA, Bruch & Schimp. (Pl. 1.)

Plants small, dichotomous, densely aggregate. Leaves long, narrow, crispate when dry, minutely papillose on both faces; areolation quadrate, chlorophyllose in the upper part, longer, hexagonal and hyaline near the base. Inflorescence monœcious. Capsule 8-striate, 8-costate when dry. Lid long-subulate, beaked. Teeth of the peristome linear-subulate, enlarged at base.

1. **R. fugax,** Bruch & Schimp. Pulvinate-cespitose; stems ½ to 1 c. m. long, radiculose below: leaves linear-lanceolate, minutely denticulate or entire at the apex, carinate in the middle, flat on the borders; costa subpercurrent: calyptra large: capsule small, broadly ovate, reddish brown, with a short neck and a pale yellow pedicel twisted to the left when dry; lid abruptly long-subulate from a broad convex base; teeth pale brown, hygroscopical and fugacious; annulus narrow, persistent. — Bryol. Eur. t. 41. *Weisia fugax,* Hedw. Spec. Musc. 64, t. 13.

HAB. Fissures of schistose and sandstone rocks in mountains. White Mountains (*Oakes, James*); Lake Superior (*Macoun*).

2. **R. denticulata,** Bruch & Schimp. Differs from the last in the plants being stronger and loosely cespitose, the leaves longer, recurved from the middle, cirrhate-crispate when dry, shining, coarsely and distantly dentate toward the apex, carinate, the costa vanishing lower, the capsule more solid, ovate-globose, with a more distinct collum, less deeply costate when empty, the teeth lanceolate at base, longer-subulate and more solid, darker-colored and persistent. — Bryol. Eur. t. 42. *Weisia denticulata,* Brid. Musc. Recent. Suppl. i. 108.

HAB. White Mountains (*Oakes, James*); sandstone rocks on Slippery Rock Creek, Pennsylvania, under the shade of *Magnolia glauca* (*Lesquereux*); near Easton, Pa. (*T. C. Porter*).

17. CYNODONTIUM, Schimp.

Plants pulvinate-cespitose. Stems radiculose-tomentose. Leaves gradually longer upward, tufted at the top of the branches, open, flexuous, crispate when dry, linear-lanceolate, crenulate or denticulate at the apex, carinate-concave, reflexed on the borders; areolation papillose, strongly chlorophyllose, opaque in the upper part of the leaves, minute, quadrate, not enlarged at the angles; costa nearly terete. Flowers monœcious, gemmiform. Capsule oval-oblong, with a regular or strumose collum, striate, more or less costate when dry. Operculum obliquely beaked. — *Dicranum,* Auct., in part.

1. **C. Schisti,** Schimp. Leaves lanceolate from an enlarged oblong base, minutely crenulate on the recurved borders: cap-

sule short-ovate, small, distinctly necked; teeth lanceolate, entire, rarely perforated, dark purple. — Synop. Musc. (ed. 2), 61. *Bryum Schisti*, Oeder, Fl. Dan. t. 88. *Weisia Schisti*, Brid. *Rhabdoweisia Schisti*, Bruch & Schimp. Bryol. Eur. t. 43. *Oncophorus Schisti*, Lindb.

HAB. Rocky Mountains (*Drummond*); Spokan Falls (*Watson*).

Closely resembling *Rhabdoweisia fugax*, differing in the papillose surface of the leaves, and the large lanceolate solid teeth.

2. **C. gracilescens,** Schimp. Tufts yellowish or pale green; stems slender: leaves linear-lanceolate, blunt at the apex, recurved and minutely crenulate on the borders, densely papillose on both faces; costa slender, ending below the apex; areolation minute, round in the upper part, elongated downward: capsule oval-oblong, slightly cernuous or erect, with a short indistinct collum; pedicel long, slender, pale, more or less flexuous; lid long-beaked; teeth regularly bifid to near the base, with linear distantly articulate segments; annulus very narrow, persistent. — Syn. Musc. 61. *Dicranum gracilescens*, Web. & Mohr, Bot. Tasch. 184; Bryol. Eur. t. 45, 46; Sulliv. Mosses of U. States, 20. *Oncophorus*, Lindb.

Var. **inflexum,** Schimp. Plants smaller, soft: capsule nearly pendent from the arcuate pedicel. — *Campylopus cirrhatus*, Hornsch.; Brid. Bryol. Univ. i. 479.

Var. **alpestre,** Schimp. Densely tufted, shorter and less divided: leaves narrower, less distinctly papillose: capsule smaller. — *Dicranum alpestre*, Wahl.

HAB. Subalpine mountains; high summits of the White Mountains, of the Adirondacks, etc., not rare; Rocky Mountains (*E. Hall*).

3. **C. polycarpum,** Schimp. Stems covered with a thick coating of radicles: leaves close, subcrispate when dry, linear or narrowly lanceolate from the oval base, serrulate at the apex, distantly papillose: capsule erect, oblong or subcernuous, with a short regular or strumose collum; pedicel long, straight, rigid; lid crenulate on the borders; teeth bifid, more or less irregularly divided; annulus distinct, easily detached. — Syn. Musc. 62. *Dicranum polycarpum*, Ehrh.; Bryol. Eur. t. 47; Sulliv. l. c.

Var. **strumiferum,** Schimp. Capsule subcernuous, broadly ovate; collum strumose.

HAB. Same as the preceding; Alaska (*Kellogg*); Lake Superior (*Agassiz*); the variety on rocks, at York Factory (*Drummond*).

4. **C. virens**, Schimp. Plants more or less densely cespitose: leaves narrowly lanceolate, subulate from the half-sheathing oblong base, recurved or revolute on the borders, entire or serrulate at the apex, smooth and minutely areolate; costa narrow, percurrent or slightly excurrent: capsule ovate-oblong or subcylindrical, more or less curved, constricted under the orifice and smooth when dry; collum short, abruptly inflated and strumose on one side and truncate underneath; lid erose at base; teeth of the peristome more regularly bifid; annulus none. — Syn. Musc. 63. *Dicranum virens*, Hedw. Musc. Frond. iii. 77, t. 32; Bryol. Eur. t. 48 and 49.

Var. **Wahlenbergii**, Bruch & Schimp. Stems slender: leaves longer-subulate, slightly reflexed on the borders, obscurely denticulate, much crispate when dry: capsule shorter, much curved when dry. — Sulliv. l. c. *Oncophorus Wahlenbergii*, Brid. *Angstrœmia*, Muell.

Var. **serratum**, Bruch & Schimp. Loosely cespitose: leaves divaricate-spreading, curling, coarsely dentate; capsule less strumose.

Var. **compactum**, Bruch & Schimp. Densely tufted, yellowish green; plants shorter and more slender: the leaves shorter, abruptly narrowed from an enlarged base, much crispate and very entire: capsule short, gibbous, rounded-strumose at the neck.

HAB. Subalpine regions, along streams and in deep glens, on trunks and decayed wood; not rare and very variable. The first variety in the Rocky Mountains (*Drummond*); the second in Oregon (*E. Hall*); the last in the White Mountains (*Oakes*), and in Tuolumne Cañon and Mono Pass, California, at 9,000 feet altitude (*Bolander*).

18. DICHODONTIUM, Schimp.

Plants loosely cespitose. Leaves soft, opaque, divaricate-squarrose, lingulate-lanceolate from an enlarged half-sheathing base; borders irregularly serrulate; medial and basilar areolation rectangular, quadrate and very small on the borders, quadrate, chlorophyllose and obscure at the apex. Flowers dicœcious. Capsule solid, cernuous, smooth; collum distinct, not strumose. Peristome large; teeth cleft to below the middle. Annulus none. — *Dicranum*, Auct., in part.

1. **D. pellucidum,** Schimp. Leaves pellucid at the oblong base, linear-lanceolate, hyaline-serrate, papillose on both faces, borders flat, opaque; costa narrow, crenulate toward the apex, vanishing below: capsule suberect, broadly oval or subglobose; pedicel soft, flexuous, pale yellow; lid obliquely long-beaked from an enlarged concave base; teeth of the peristome densely articulate, dark red below, orange above.—Syn. Musc. 65. *Dicranum pellucidum*, Hedw. Sp. Musc., 142; Bryol. Eur. t. 50 and 51. *Angstrœmia pellucida*, Muell.

Var. **Americanum,** Lesq. Leaves twisted-crispate when dry, shorter and narrower; cells of the basilar areolation longer: capsule longer.

Var. **serratum,** Schimp. Stems longer; leaves larger and coarsely dentate toward the apex: capsule oblong, nearly erect.

Hab. Cascade Mountains (*Lyall*), Fort Yale (*Macoun*); the first variety at Brattleborough, Vermont (*Frost*), and in deep glens, New Jersey and New York (*Austin*); var. *serratum*, Oregon (*E. Hall*).

2. **D. Canadense.** Stem stout, simple: leaves enlarged and clasping at base, subulate-lanceolate, divaricate above, serrulate on the borders; costa strong and percurrent; cells of the areolation elongated at base, somewhat oblong above, the marginal shorter, all pellucid: capsule turbinate, unequal, with a broad orifice; pedicel long, red; teeth of the peristome large, red, dicranoid.—*Cynodontium Canadense*, Mitten, Journ. Linn. Soc. viii. 17. *Dicranella Schreberi*, var. *occidentale*, Austin, Bull. Torr. Club, vi. 344.

Hab. British America, probably from the Rocky Mountains (*Drummond*, n. 101, in part).

Comparable to *Dicranella squarrosa*, from which it differs in the leaves more narrowly subulate and with the borders serrulate. It should perhaps be placed under *Dicranella*.

19. TREMATODON, Michx. (Pl. 1.)

Plants short, loosely cespitose, sparingly branching. Leaves lanceolate-subulate, costate; cells of the areolation large. Flowers autœcious. Capsule long-pedicellate, oblong, slightly arcuate, with a long narrow collum. Operculum long-subulate. Annulus simple or compound. Teeth of the peristome narrowly lanceolate, cleft to near the base or lacerate, purple.

1. **T. ambiguum**, Hornsch. Stems short, 1 or 2 c. m. long: leaves open, lanceolate-subulate, canaliculate from an oblong-ovate base; perichætial leaves large, oblong, with a short lanceolate-acuminate point: capsule equal in length to the cylindrical slightly arched collum or shorter; annulus large, revoluble; teeth of the peristome cleft to near the base or in the middle only; segments sometimes irregularly lacerate. — Regens. Flora, ii. 88; Bryol. Eur. t. 96. *Dicranum ambiguum*, Hedw. Musc. Frond. iii. 87, t. 36. *Trematodon longicollis*, Sulliv. & Lesq. Musc. Bor.-Am. n. 75, in part, and (ed. 2), n. 96.

Hab. Wet sandy places in hilly districts; peat bogs, ditches, etc.

2. **T. longicollis**, Michx. Differs from the last in the shorter plants, the perichætial leaves more gradually and longer acuminate, the collum of the oblong-cylindrical capsule twice as long, the teeth of the peristome narrower subulate with nodose articulations perforated along the divisural line, rarely disjointed in two segments. — Pl. Bor.-Am. ii. 289; Sulliv. Musc. Allegh. n. 173, and Icon. Musc. 31, t. 19; Sulliv. & Lesq. Musc. Bor.-Am. (ed. 2), n. 95.

Hab. Moist clayey or sandy soil, from Pennsylvania and New Jersey southward.

20. ANGSTRŒMIA, Bruch & Schimp.

Plants densely gregarious. Stems erect. Leaves minute, closely imbricate and appressed, with a thin costa vanishing below the apex; areolation loose. Flowers dicœcious; male flowers discoid-gemmaceous, terminal. Capsule erect, globose-ovate, symmetrical, solid, long-pedicellate. Lid short-beaked from a conical base. Teeth of the peristome bifid from the middle, rarely simple.

1. **A. longipes**, Bruch & Schimp. Stems simple or sparingly divided; basilar branches filiform, strict: lower leaves distant, very small, ovate, obtusely short-acuminate, the upper and the perichætial tufted, oblong-ovate, longer acuminate, concave: capsule small, truncate when deoperculate; annulus none. — Bryol. Eur. t. 94. *Weisia longipes*, Sommerf. Suppl. Flor. Lapp. 52, t. *Dicranum julaceum*, Hook. & Wils., Drumm. Musc. Am. n. 100.

Hab. Portage on the Columbia River, British America (*Drummond*).

21. DICRANELLA, Schimp.

Plants generally small. Leaves smooth; cells of the loose areolation slightly chlorophyllose, the upper oblong-hexagonal, the lower long-rectangular. Flowers dicœcious, rarely monœcious. Capsule generally cernuous, sometimes striate. Peristome large; teeth regularly bifid, closely articulate, vertically striolate; segments filiform, minutely granulose.

* *Leaves squarrose or spreading all around.*

1. **D. crispa,** Schimp. Monœcious: plants small, slender, subcespitose: leaves square-ovate, half-sheathing at base, abruptly long-subulate, minutely serrulate at the apex, spreading, flexuous, crispate when dry: capsule without collum, erect, short-oval, plicate-ribbed when dry; lid long-subulate, erect or oblique, crenulate at base; annulus narrow. — Bryol. Eur. Coroll. 13; Braithw. Brit. Moss-Fl. i. 105, t. 15, D. *Dicranum crispum*, Hedw. Stirp. Musc. ii. 91, t. 33; Bryol. Eur. t. 55.

Hab. Near the Highlands, Rocky Mountains, British America (*Drummond*); Galton Mountains (*Lyall*); McLeod Lake, Canada (*Macoun*).

2. **D. Grevilleana,** Schimp. Monœcious: plants more densely crowded and stronger: leaves enlarged and undulate at the oblong base, abruptly long-lanceolate subulate, entire; perichætial leaves with a long tubulose sheathing base: capsule cernuous, obovate or oval, obscurely striate, with a short strumose collum; lid subulate, shorter than in the last species; annulus none. — Bryol. Eur. Coroll. 13. *Dicranum Schreberianum*, Grev. Scot. Crypt. t. 116; Hook. & Wils., Drumm. Musc. Am. n. 97. *Dicranum Grevilleanum*, Bryol. Eur. t. 54. *Anisothecium Grevillei*, Lindb. Utk. Nat. Grupp. Eur. Bladm. 33; Braithw. l. c. 113, t. 16, D.

Hab. Alpine stations in British America (*Drummond*).

It is not certain that this species has been found in America. According to Schimper, n. 97 of Drummond's Mosses represents it, but an examination of the specimens given in three different sets under this number shows that they all represent *D. Schreberi*.

3. **D. Schrebèri,** Schimp. In size and aspect this species is like the preceding, from which it differs in its dicœcious inflorescence, the leaves shorter, carinate above, not as abruptly and narrowly subulate, serrulate toward the apex, and in the

shorter less distinct collum of the smooth (not striate) capsule. — Bryol. Eur. Coroll. 13. *Dicranum Schreberi*, Swartz.; Hedw. Sp. Musc. 144, t. 33; Bryol. Eur. t. 53. *Anisothecium crispum*, Lindb.; Braithw. l. c., t. 16, E.

Var. **occidentalis**, Aust. Leaves often very entire; cells half as broad. — Bull. Torr. Club, vi. 344.

HAB. Hills in the Adirondack Mountains (*Lesquereux*); White Mountains of New England, and clay ditches near Lancaster, Pennsylvania (*James*); the variety near Portland, Oregon (*Nevius*).

4. **D. squarrosa**, Schimp. Dicœcious: plants robust, cespitose, radiculose, yellowish or dark-green: leaves enlarged, and sheathing at the oblong base, lanceolate, concave, divaricate-squarrose from the middle, blunt at the crenulate apex: capsule obovate or oblong-ovate, cernuous, with a short distinct collum or none; lid long-conical or short-beaked; annulus none. Bryol. Eur. Coroll. 13. *Dicranum squarrosum*, Schrad. Journ. Bot. v. 68; Bryol. Eur. t. 52. *Anisothecium squarrosum* Lindb.; Braithw. l. c. 114, t. 16, F.

HAB. Alaska (*Harrington*).

* * *Leaves secund or subsecund. Flowers dicecious.*

5. **D. cerviculata**, Schimp. Densely and widely cespitose, bright green; stems short, 1 cent. long: leaves half-clasping at base, flexuous, spreading or secund, lanceolate-subulate, concave, entire, glossy; costa flat, percurrent, enlarged at base: capsule light brown, broadly ovate, gibbous with a short strumose collum; pedicel slender, yellow; annulus very narrow, persistent; lid long subulate-rostrate. — Bryol. Eur. Coroll. 13; Braith. l. c. 109, t. 16, A. *Dicranum cerviculatum*, Hedw. Musc. Frond. iii. 89, t. 37; Bryol. Eur. t. 56; Sulliv. Mosses of U. States, 21.

HAB. Upon peat, on the sides of ditches in cranberry marshes of Northern Ohio (*Lesquereux*); White Mountains (*James*).

6. **D. varia**, Schimp. Gregarious or cespitose; plants short: leaves erect-spreading or turned to one side, oblong at base, gradually lanceolate-subulate, carinate, entire or slightly denticulate at the apex; costa percurrent: capsule reddish-brown, cernuous, oblong-ovate, with a short indistinct collum, constricted under the orifice when dry; lid large, short-beaked; peristome large, dark red, the teeth connivent at the apex into a cone; annulus none. — Bryol. Eur. Coroll. 13. *Dicra-*

num varium, Hedw. Musc. Frond. ii. 93, t. 34; Bryol. Eur. t. 57 and 58; Sulliv. l. c. *Anisothecium varium*, Mitt. *A. rubrum*, Lindb.; Braithw. l. c. 110, t. 16, B.

HAB. Wet ground; clayey and sandy banks in plain districts.

A very common and variable species. Plants with capsules of diverse forms are often found in the same tufts.

7. **D. rufescens**, Schimp. Of the same size and appearance as the last, differing in the less crowded falcate-secund linear-lanceolate leaves with a broader areolation, the capsule ovate, erect, symmetrical, smaller, the pedicel dark red, and the lid conical-acuminate. — Bryol. Eur. Coroll. 13. *Dicranum rufescens*, Turner, Musc. Hibern. 66; Bryol. Eur. t. 59; Sulliv. l. c. *Anisothecium rufescens*, Lindb.; Braithw. l. c. 112, t. 16, C.

HAB. Clay and gravelly soil, plains and mountains.

8. **D. debilis.** Size and appearance of the plants same as in the preceding. Leaves gradually increasing in length from the base upward, linear-lanceolate, with borders undulate and recurved; areolation loose; costa vanishing below the blunt apex: capsule oval, erect, symmetrical, without collum; lid long-rostrate, straight; annulus large, simple. — *Dicranum debile*, Hook & Wils., Drumm. Musc. Am. (Coll. II.), n. 51, 52; Sulliv. Mosses of U. States, 21, and Icon. Musc. 33, t. 20.

HAB. Banks of ditches and roadsides, South Carolina to Florida; very common in Cuba.

9. **D. subulata**, Schimp. Loosely tufted and somewhat larger than the last: leaves half-clasping at the elliptical base, narrowed above into a long setaceous subulate entire point; costa excurrent; areolation minute; perichætial leaves tubulose at base, abruptly longer subulate: capsule cernuous, ovate, gibbous, not strumose or slightly so, obscurely striate, plicate when dry; pedicel long, red; lid long subulate-rostrate, curved; annulus double. — Bryol. Eur. Coroll. 13. *Dicranum subulatum*, Hedw. Spec. Musc. 128, t. 34; Bryol. Eur. t. 60; Sulliv. l. c. 21. *Dicranella secunda*, Lindb.; Braithw. l. c. 106, t. 15, E.

HAB. Alpine and subalpine regions, eastern and western slopes of North America; not uncommon.

10. **D. heteromalla**, Schimp. Plants cespitose, of medium size, simple or forking: leaves crowded, secund, lanceolate from the base, narrowly long-subulate, denticulate or entire at the apex, glossy; perichætial leaves with a short half-clasping base, abruptly and narrowly long-subulate: capsule cernuous, more

or less reclined, ovate or oblong, obscurely striate, plicate when dry, with a short, often indistinct, collum, slightly constricted under the obliquely inclined orifice; pedicel yellow; lid long subulate-beaked; teeth bifid or trifid; annulus simple, very narrow. — Bryol. Eur. Coroll. 13; Braithw. Brit. Moss-Fl. i. 107, t. 15, G. *Dicranum heteromallum*, Hedw. Musc. Frond. i. 68, t. 26; Bryol. Eur. t. 62; Sulliv. l. c.

Hab. Rocks, clay banks, naked soil, roots of trees, especially in mountainous regions; very common.

A very variable species; the leaves sometimes erect-open and strict (var. *orthophylla*), or interruptedly tufted (var. *interrupta*, Schimp.); capsule sometimes straight (var. *orthocarpa*), etc. It is easily distinguished from the preceding by the bright color of the glossy leaves and the yellow pedicel of the reddish capsule, which elongated when dry has its orifice curved inward or oblique.

11. **D. curvata,** Schimp. Loosely cespitose; stems shorter than in the last species: leaves setaceous, subulate from a short ovate base, canaliculate upwards, minutely denticulate at the apex, falcate; perichætial leaves longer at the oblong base: capsule erect or scarcely inclined, oblong, distinctly striate, symmetrical; lid large at the highly convex base, less narrowly subulate; teeth regularly bifid to the middle; annulus broader. — Bryol. Eur. Coroll. 13; Braithw. l. c. 106, t. 15, F. *Dicranum curvatum*, Hedw. Sp. Musc. 132, t. 31; Bryol. Eur. t. 61.

Hab. On sandstone, Lancaster County, Pennsylvania (*T. C. Porter*); White Mountains (*James*). Very rare.

22. DICRANUM, Hedw. (Pl. 1, 2.)

Plants large, once or many times dichotomous. Stems radiculose at base or all covered with a coating of radicles. Leaves spreading or secund, rarely papillose, lanceolate-subulate or long-lanceolate, with a solid semi-terete more or less dilated costa; cells of the areolation linear-oblong in the upper part of the leaves, long and generally very narrow toward the base, enlarged quadrate and sometimes inflated and colored at the angles; perichætial leaves more or less sheathing. Flowers monœcious or diœcious. Capsule erect or cernuous, with a regular or rarely strumose collum. Operculum subulate-beaked. Teeth of the peristome bifid, purple at base.

* *Plants small, tawny yellow: capsule short-pedicellate, enlarged at the orifice when dry; teeth very hygroscopic, radiate-spreading when dry.*

1. **D. fulvellum,** Smith. Monœcious: densely pulvinate; stems slender, 1 c.m. long: leaves falcate-secund, concave, oblong at base, subulate-canaliculate to the obscurely serrulate apex; costa percurrent; perichætial leaves sheathing to the middle, lanceolate, long setaceous-tubulose above: capsule small, ovate-oblong, erect or slightly cernuous, with a short equal collum, smooth, constricted under the broad orifice when dry; lid obliquely short-beaked; teeth split into two unequal long-subulate segments; annulus double. — Fl. Brit. iii. 1209; Schimp. Syn. 77; Braithw. l. c. 141, t. 19, G. *Arctoa fulvella,* Bryol. Eur. t. 86; Sulliv. Mosses of U. States, 19.

Hab. On wet black soil in alpine regions, and in fissures of rocks; highest mountains of New England and New York.

* * *Plants larger, many times dichotomous, prostrate at base: leaves close, falcate: capsule cernuous with strumose collum: flowers monœcious.*

2. **D. Starkii,** Web. & Mohr. Plants green, cespitose: leaves setaceous-subulate from an ovate-lanceolate base, entire, falcate-secund, crispate when dry; cells of the areolation linear nearly to the base, square-inflated at the angles: capsule cylindrical-oblong, more or less arcuate, obscurely striate; lid subulate, long-beaked; annulus double, large. — Bot. Tasch. 189; Bryol. Eur. t. 64; Braithw. Brit. Moss-Fl. i. 144, t. 20, C.

Hab. Alpine regions, in fissures of rocks and on the ground; White Mountains (*Oakes, James*); Rocky Mountains (*Drummond,* Musc. Am. n. 83).

3. **D. falcatum,** Hedw. Differs from the last in its more compact growth, the leaves more regularly and strongly falcate, dark green passing to black, obscurely denticulate at the apex, not crispate when dry, with alar cells smaller and scarcely or not at all inflated: the capsule is shorter, thick, inflated or gibbous, not striate, with a shorter pedicel; peristome dark purple; annulus simple, narrower. — Sp. Musc. 150, t. 32; Bryol. Eur. t. 65; Braithw. l. c. 143, t. 20, B.

Hab. Same as the preceding.

4. **D. Blyttii,** Bruch & Schimp. Tufts loose, dusky green; stems erect, divided into fragile slender branches: leaves erect

at base, spreading, flexuous or subsecund above, lanceolate-subulate, entire, shorter and narrower than in the two preceding species, very thinly costate; alar cells large, inflated; perichætial leaves long-sheathing, shorter pointed: capsule smaller, cernuous or incurved, not gibbous but strumose, smooth; teeth of the peristome narrower: male flowers near the base of the innovations, not close to the perichætium as in both the preceding species. — Bryol. Eur. t. 63. *D. Schisti*, Lindb.

Hab. Same as the preceding.

* * * *Plants cespitose, tomentose: areolation inflated at the basal angles: flowers dicœcious; perichætium sheathing: capsule erect, long-ovate with a short equal collum; pedicel pale, twisted to the left when dry; teeth narrower.*

5. **D. strictum,** Schleich. Plants pale or yellowish green: leaves rigid, very brittle, lanceolate-subulate, canaliculate above; alar cells very large, orange: teeth dark-orange, irregularly bifid; annulus very narrow. — Schwægr. Suppl. i. 188, t. 43; Bryol. Eur. t. 66.

Hab. Decayed trunks; Lake Superior (*Agassiz*); Little Slave Lake (*Macoun*); Fort Colville (*Lyall*); Northwestern Montana, and on Kettle River and at Spokan Falls, Washington Territory (*Watson*); mountains of California (*Bolander*).

6. **D. montanum,** Hedw. Plants densely and widely cespitose: leaves soft, spreading or slightly secund, crispate when dry, lanceolate-subulate, concave, serrulate, slightly papillose on the back and green above, pale, smooth and loosely areolate in the lower part; alar cells small, tawny; perichætial leaves abruptly subulate: capsule pale, obscurely striate; annulus rather large. — Sp. Musc. 143, t. 35; Bryol. Eur. t. 67.

Hab. On decaying trunks, northern and mountain regions; rare.

7. **D. viride,** Schimp. Plants pulvinate and cespitose: leaves brittle, open-erect, lanceolate-subulate, canaliculate, thick-costate; areolation rectangular, short in the upper part, larger and hyaline from the middle downward, brown at the angles; perichætial leaves abruptly subulate: capsule oblong, erect or slightly curved. — Bryol. Eur. Suppl. *Dicranum*, 1, t. 1. *Campylopus viridis*, Sulliv. & Lesq. Musc. Bor.-Am. n. 72; Sulliv. Mosses of U. States, 103, and Icon. Musc. 30, t. 18.

Hab. Trunks of prostrate trees in dense woods; not rare in the Northern States, but not yet found in fruit.

8. **D. flagellare,** Hedw. Tufts compact, bright green; stems short, producing from the axils of the upper leaves small slender fugacious branchlets (*flagellæ*) with very small appressed bracteal leaves: stem-leaves lanceolate-subulate, concave, denticulate at the apex, subsecund, the upper twisted when dry; costa broad, compressed: capsule long-cylindrical, striate, somewhat plicate when dry. — Musc. Frond. iii. 1, t. 1; Bryol. Eur. t. 68; Braithw. l. c. 155, t. 23, C.

Var. **subfluitans,** Aust. Stems immersed, longer, slender; leaves more distant. — Bull. Torr. Club, vi. 344.

Hab. Decayed trunks in deep woods, very common. The variety in depressions of flat rocks; New York, sterile (*Austin*).

9. **D. fulvum,** Hooker. Plants dusky yellow or brownish green, loosely cespitose; stems solid, curved down at base: leaves spreading, flexuous or falcate-secund, tufted at the apex, crispate when dry, narrowly ovate at base, gradually long-setaceous-subulate, canaliculate to the denticulate apex: capsule short-pedicellate, cylindrical-oblong, brown or black, plicate when old; annulus double, narrow. — Musc. Exot. t. 149. *D. interruptum,* Brid.; Bryol. Eur. t. 69; Sulliv. Mosses of U. States, 22. *Syrrhopodon* (?) *Rauei,* Aust. Bull. Torr. Club, vi. 74.

Hab. Shaded sandstone rocks in hilly regions; not rare.

Judging from the description of the author, *Syrrhopodon Rauei* differs from this species in being less robust, the leaves shorter and less crowded, the areolation less enlarged, the costa not as strong, the male flowers terminal. These are the characters of the young plants of *D. fulvum,* the leaves being shorter, less crowded, and of a more delicate texture. The male flowers are always terminal, only pushed aside each succeeding year by the new innovations, the tufted leaves at the tops of the innovations giving the stems an interrupted appearance.

10. **D. longifolium,** Hedw. Tufts soft, pale or whitish green, glossy; stems arched and geniculate, slender, slightly radiculose: leaves long, falcate-secund, rarely spreading, open at the short lanceolate base, constricted into a very long subtubulose-subulate point, serrate above on the borders and the back; inner perichætial leaves convolute and sheathing to near the apex: capsule cylindrical, erect or slightly curved, not striate, yellowish brown; pedicel reddish in the lower part. — Musc. Frond. iii. 24, t. 9; Bryol. Eur. t. 72; Braithw. l. c. 158, t. 24, B.

Var. **strictius,** Aust. Stems longer, more rigid, immersed; leaves shorter, erect. — Bull. Torr. Club, vi. 344.

Var. **plumosum**, Lesq. Hypnoid-plumose in aspect; tufts very loose; stems mostly simple, without radicles: leaves longer, narrower, open, flexuous or falcate, denticulate on the borders, rugose on the back. — *Dicranodontium nitidum*, James, Bull. Torr. Club, vi. 34.

HAB. Rocks and bark of living trees, the beech especially, in subalpine regions; not rare in the Adirondack mountains. Var. *strictius*, in depressions on flat rocks, with the variety of *D. flagellare* (*Austin*); var. *plumosum*, at Dixville Notch, New Hampshire, under a dam (*James*).

11. **D. albicans**, Bruch & Schimp. Plants densely cespitose, yellowish green when moistened, whitish when dry; stems stout and very long, thickly tomentose: leaves erect or slightly turned to one side, oblong at base, narrowly lanceolate-acuminate, nearly tubulose by the incurving borders; costa very broad, enlarged at base and filling the whole leaf except a narrow border; outer perichætial leaves short-sheathing at base, abruptly lanceolate-subulate and broadly costate, the inner long-sheathing, ecostate: capsule long, cylindrical, smooth; beak of the lid as long as the capsule, narrowly subulate; teeth large, densely striolate, papillose above, connate at base, bifid and perforated to the middle; annulus simple, large. — Bryol. Eur. t. 73. *Campylopus Shawii*, Wils.

HAB. Subalpine and arctic regions; Northwestern America (*Douglas*).

* * * * *Plants of large size, radiculose-tomentose to the base of the highest innovations: leaves long, more or less curved, lanceolate-subulate, glossy; areolation of the basilar angles broadly quadrate: flowers dicœcious; male buds often produced on small annual plants from the prothallium and mixed in the felt of radicles: capsule long, cernuous, arcuate.*

12. **D. elongatum**, Schwaegr. Plants in compact yellowish green tufts; stems very long and slender: leaves open-erect or subsecund, lanceolate-subulate from an enlarged oblong base, very entire, smooth; costa narrow, vanishing in the apex; cells of the areolation very narrow, enlarged, quadrangular at the angles: capsule cernuous, gibbous-ovate, substriate, furrowed-plicate when empty; pedicel pale, comparatively short; lid pale, long-subulate, rostrate from a conical base; annulus simple, narrow. — Suppl. i. 171, t. 43; Bryol. Eur. t. 76. *D. Macouni*, Aust., Coult. Bot. Gaz. ii. 96, sterile specimens.

Var. **orthocarpum**, Schimp. Plants slender: leaves shorter, erect; capsule small, erect.

Hab. Bogs and damp rocks, in alpine and subalpine regions; Mount Marcy; White Mountains; Northern shores of Lake Superior (*Agassiz*); Rocky Mountains (*Drummond*); Vancouver Island (*Macoun*).

13. **D. fuscescens**, Turn. Plants loosely cespitose, variable in size, slender or robust: leaves more or less tufted at the tops of the innovations, secund or flexuous, pale green or tawny yellow, slightly twisted in the upper part when dry, narrowly lanceolate-subulate, concave; costa flat and broad; cells of the areolation minute, rounded-quadrate in the upper part of the leaves, long and narrowly rectangular from the middle downward, even to the base near the costa, enlarged, quadrate and yellow at the angles; perichætial leaves sheathing, abruptly short-subulate pointed: calyptra large, white: capsule ovate-oblong, more or less turgid, inflated at the collum, striate, furrowed when dry; lid pale, long subulate-beaked; teeth irregularly split and perforated; annulus narrow.—Musc. Hibern. 60, t. 5. *D. congestum*, Brid. Musc. Recent. Suppl. i. 176; Bryol. Eur. t. 77; Sulliv. Mosses of U. States, 22.

Var. **longirostre**, Schimp. Leaves narrower, crispate when dry, subserrulate at the apex: capsule shorter, ovate, turgid, distinctly striate; lid with a longer slender beak.—*D. longirostre*, Schwaegr.

Var. **flexicaule**, Schimp. Stems long, decumbent, geniculate or flexuous, without radicles: leaves falcate secund: capsule long-pedicellate.—*D. flexicaule*, Brid.

Var. **angustifolium**, Schimp. Plants short, densely tufted: leaves erect, narrow, blackish or dull green.

Hab. On rocks and decayed wood, very common in mountainous regions and very variable. The above described varieties and some others less marked have been observed in North America. The species is rare in California. A variety with leaves papillose on the back has been sent from the redwoods of that State by *Bolander*.

14. **D. Muhlenbeckii**, Bruch & Schimp. Plants densely cespitose and tomentose, dark green, passing to black when old; stems long, erect: leaves crowded, spreading, flexuous, twisted-crispate when dry, lanceolate-subulate, concave or subtubulose above, denticulate toward the apex, smooth on the back, loosely areolate toward the base; alar cells not inflated nor enlarged, orange-colored; inner perichætial leaves long-

tubulose, abruptly short-subulate: capsule erect, cylindrical, subarcuate, scarcely striate, on a long straw-colored pedicel; lid shorter than in the last species, oblique; annulus narrow. — Bryol. Eur. t. 78. *Campylopus Rauei*, Aust., Coult. Bot. Gaz. i. 28.

HAB. Roots of trees in the Rocky Mountains (*E. Hall*); Santa Fe, New Mexico (*Fendler*).

15. **D. rhabdocarpum,** Sulliv. Closely allied to the preceding, it differs in the plants being simple or rarely divided by innovations, the leaves lanceolate or slightly subulate or linear-lanceolate, acuminate, open-erect or subsecund, crispate when dry, the inner perichætial leaves narrowed into a long thong-shaped point, the capsule narrower cylindrical, erect, substrumose or inflated at the long collum, strongly striate especially when dry, polished, the long straight-beaked lid, the teeth pale red and more regular, the annulus large and subrevoluble. — Mem. Am. Acad. n. ser. iv. 172, t. 3.

HAB. Same as the last; Rocky Mountains (*E. Hall, Downie*); Mt. Graham, Arizona (*Rothrock*); Santa Fe (*Fendler*).

16. **D. fragilifolium,** Lindb. Plants densely cespitose; stems slender, erect: leaves erect, strict, brittle and generally broken at the apex, lanceolate, gradually narrowed from the base into a long setaceous point, very entire, glossy; cells of the areolation quadrate above, rectangular below, filled with greenish yellow chlorophyll, pellucid and enlarged at the angles; perichætial leaves convolute, sheathing, constricted into a setaceous point: capsule ovate, striate by dark lines to below the orifice, furrowed when dry; lid with a subulate curved pale beak; teeth entire to above the middle, bifid, not perforated above; annulus simple, revoluble. — Schimp. Syn. 89, and Bryol. Eur. Suppl. *Dicranum*, 2, t. 2.

HAB. Vancouver Island (*Macoun*, 1875).

17. **D. scoparium,** Hedw. In loose yellowish, rarely green tufts; stems solid, generally long: leaves secund or falcate, rarely erect, more or less tufted at the top of the innovations, linear-subulate from a lanceolate base, sharply serrate and undulate on the borders in the upper part; costa compressed, furrowed and denticulate on the back toward the apex; areolation rectangular in the upper part, narrower and vermicular toward the base, large, quadrate, orange-colored at the angles: male

plants produced in buds in the felt of radicles: capsule long, cernuous, rarely erect, cylindrical, somewhat incurved, arcuate when dry, solid; lid convex at base, gradually narrowed into a strong beak, as long as the capsule; peristome solid, dark red; annulus none. — Fund. Musc. ii. 92; Bryol. Eur. t. 75; Braithw. l. c. 146, t. 21, A. *Bryum scoparium*, Linn. Spec. Pl. 1117.

Var. **squarrosum.** Leaves broader, reflexed-squarrose, the perichætial costate, with a longer flexuous dentate point: capsule narrower. — *D. scoparium*, var., Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. n. 60.

Var. **paludosum,** Bruch & Schimp. Tufts light green; plants long, robust: leaves large, rugulose. Much like *D. paludosum*, and often confounded with it.

Var. **pallidum.** Plants and leaves pale green; cells of the areolation long and vermicular, irregularly walled; perichætial leaves rounded-sinuate above: capsule cylindrical, very arched. — *D. pallidum*, Muell.; not Bruch & Schimp. *D. scoparium*, var., Sulliv. & Lesq. l. c., n. 61.

Hab. Sandy ground, roots of trees, rocks, etc., plains, hills and mountains; very common and variable. The first variety on granite rocks in the Alleghany Mountains, Pennsylvania; the second in bogs, Northern Ohio, etc.; the last in woods in level districts.

18. **D. majus,** Turn. Somewhat like the preceding, but easily recognizable by the dark green color of the long slender loosely and irregularly cespitose plants, which are sometimes scattered among other mosses, by the much longer narrower more distinctly falcate glossy leaves, and the shorter soft green capsules turning to black when old, with short pale pedicels generally aggregated two or more in the same perichætium. — Musc. Hibern. 59, t. 4; Bryol. Eur. t. 85.

Hab. Deep woods, in subalpine and northern regions; rare in America. Sitka (*Bischoff*); Port Discovery, Washington Territory (*Pickering*).

In the aggregation of two or more capsules in the same perichætium this species resembles *D. Drummondi*, but it is at once recognized by its long slender stems, the falcate narrow leaves, the color of the plants, etc.

* * * * * *Plants of great size, thickly tomentose-radiculose: leaves long, glossy, transversely rugose; costa flat: male buds originating in the tomentum, rarely on separate plants.*

19. **D. palustre,** La Pyl. Widely cespitose; stems slender, yellowish green: leaves open-erect, obscurely undulate above,

linear-lanceolate, serrate on the back and on the borders, narrowly costate to below the apex; areolation narrow, enlarged and broadly rectangular at the base and the angles; perichætial leaves tubulose, abruptly narrowed into a short point: capsule ovate-oblong, erect or slightly cernuous, striate, strumose at the collum, tawny yellow; pedicel slender, somewhat flexuous, yellowish above, pale red below; lid pale red, long-subulate; annulus none. — Brid. Bryol. Univ. i. 814; Bryol. Eur. t. 79. *D. Bonjeani*, DeNot.; Braithw. l. c. 149, t. 21, B.

Var. **Brewerianum**, Lesq. Leaves narrower, scarcely undulate, falcate-secund; cells of the areolation longer. — Mem. Calif. Acad. i. 7.

HAB. Peat bogs of Northern Ohio and Pennsylvania (*Lesquereux*); Lake Winnipeg (*Bourgeau*); Vancouver Island (*Macoun*). The variety in mountains of California (*Brewer*).

A rare or rarely observed species, resembling a variety of *D. scoparium*, but differing in the slender erect stems, the soft leaves loosely areolate at base, the inner perichætial leaves short-apiculate, the short pale soft distinctly striate capsule, etc.

20. **D. Schraderi**, Web. & Mohr. Tufts wide, compact, yellowish green; stems often very long, erect: leaves close, erect, appressed and subsecund, the upper bright green, the lower yellowish, lanceolate, obtusely pointed, deeply undulate, sharply dentate on the back and borders from the middle upward; cells of the areolation small, rhomboidal-quadrate and obscure in the upper part, long and narrowly rectangular toward the base, abruptly much dilated and orange-colored at the angles: capsule slightly longer than in the last species, more obscurely striate; peristome small; annulus simple, narrow. — Crypt. Germ. 177; Schwaegr. Suppl. i. 166, t. 41; Bryol. Eur. t. 80.

HAB. Common in peat bogs; mountains and cold regions.

21. **D. spurium**, Hedw. Robust, loosely cespitose, straw-color or yellowish green; stems erect or decumbent, brittle: leaves interruptedly tufted, the lower short, ovate-lanceolate, concave; the upper longer, linear-lanceolate, undulate from below the middle upward, rugose, papillose on the back, serrate on the border and on the subpercurrent costa; cells of the areolation small, ovate-quadrate and obscure in the upper part, narrowly linear in the middle and down to the base near the costa, round-quadrate, enlarged and dark-colored near the angles; perichætial leaves tubulose, shortly subulate-pointed: fruit soli-

tary: capsule oblong or subcylindrical, incurved, striate, deeply furrowed and constricted under the orifice when dry; annulus double. — Musc. Frond. ii. 82, t. 30; Bryol. Eur. t. 81; Braithw. l. c. 151, t. 22, A. *D. pallidum*, Bruch & Schimp. Bryol. Eur. i. (*Dicranum*) 39.

Var. **condensatum.** Stems short, densely tufted: leaves shorter, broader, rigid, very close, open when dry. — *D. condensatum*, Hedw. Spec. Musc. 139, t. 34. *D. spurium*, var., Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. n. 68[b].

Hab. Shaded sandy ground; the variety in dry sandy places or hills, especially in southern districts; not rare.

22. **D. Drummondi,** Muell. Plants closely and widely cespitose, bright green above; stems robust: lower leaves spreading or recurved, the upper secund or falcate, twisted at the apex when dry, oblong, concave in the lower part, lanceolate-subulate, convolute or canaliculate, denticulate above; costa broad, vanishing with or below the apex, denticulate or papillose in the upper part; cells of the areolation oval-oblong, very small toward the apex, oblong or broadly linear in the middle, abruptly much enlarged below, round-quadrate, reddish brown, filling the whole tumescent subauriculate base: capsules aggregated, short-pedicellate, cylindrical-oblong, incurved, slightly inflated at base, deeply furrowed and constricted under the orifice when dry; teeth distantly articulate, split to near the base, regular; annulus large, simple. — Syn. Musc. i. 356, in part; Sulliv. Mosses of U. States, 23, and Icon. Musc. Suppl. 48, t. 33; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. (ed. 2), n. 88; Lindb. Adnot. Bryol. in Bot. Notis. 1865, 78 and 79.

Hab. Shade of pine woods, New Jersey; subalpine regions of New York and New England; eastern slope of the Rocky Mountains; not rare.

23. **D. undulatum,** Turn. Plants in loose wide disjointed tufts; stems thick, very tomentose: leaves spreading-subsquarrose, the terminal involute or secund, pale green, oblong-ovate toward the decurrent base, linear-lanceolate, very undulate above, sharply denticulate; costa narrow, bilamellate on the back and serrate; areolation pale, loose, enlarged at base: fruits clustered: capsule long-cylindrical, arcuate, obscurely striate; lid with a very long subulate beak; annulus narrow. — Musc. Hib. 59; Bryol. Eur. t. 82, 83.

Hab. Shaded swampy ground; plains and mountains; common.

23. DICRANODONTIUM, Bruch & Schimp. (Pl. 1.)

Plants densely cespitose: stems slender, tomentose, dichotomous or fastigiately branching. Leaves spreading or falcate-secund, rigid, long-setaceous subulate from a lanceolate base, glossy; costa enlarged, filling the whole narrow part of the leaf; basilar areolation rectangular, hyaline, enlarged and brown-colored at the angles. Flowers dicœcious. Calyptra large, cucullate, entire at base. Capsule oblong or cylindrical, soft, not striate or plicate when dry, erect on a long flexuous-arched pedicel. Lid convex at base with a long acicular beak. Peristome attached deep below the orifice of the capsule, of 16 narrow teeth cleft to near the base into two linear unequal segments, distantly articulate, striolate to the apex, connivent at apex when moistened, open when dry. Annulus none.

1. **D. longirostre**, Bruch & Schimp. Tufts soft, yellowish green above the thick reddish brown tomentum: leaves easily detached, slightly sheathing at base, serrate or entire at the apex, smooth on the back; alar cells inflated, hyaline or reddish, filling the whole base on both sides of the costa. — Bryol. Eur. t. 88. *Didymodon longirostrum*, Web. & Mohr, Tasch. 155.

HAB. On sandstone rocks; Alleghany Mountains (*Sullivant*); Southern Ohio (*Lesquereux*), sterile.

24. CAMPYLOPUS, Brid. (Pl. 1.)

Aspect of *Dicranum*. Leaves broadly costate; areolation enlarged, hyaline, brown-tinted at the often excavated angles; costa sulcate or smooth on the back. Flowers dicœcious. Calyptra cucullate, ciliate at base. Capsule symmetrical, solid, generally striate. Lid subulate-beaked. Peristome as in *Dicranum*. Annulus large, simple or compound.

As the peristome, ciliate calyptra, and thick texture of the annulated capsule are the essential characters which separate this genus from the last, and as the plants are generally found sterile, it is often difficult to determine their reference to *Dicranodontium* or to *Campylopus*. As also the characters of the leaves of both genera are variable, the American species, all described from sterile specimens, are subject to criticism. The descriptions, however, are made upon good and generally numerous specimens.

1. **C. flexuosus,** Brid. Tufts flattened, rigid, bright green above, reddish tomentose below: leaves crowded, open or turned to one side, solid, lanceolate-subulate, serrulate at the apex, deeply excavated at the angles; costa smooth on the back: capsule oblong-ovate or elliptical, costate when dry; annulus large, simple. — Bryol. Univ. i. 469; Bryol. Eur. t. 89; Braithw. Brit. Moss-Fl. i. 132, t. 18, F.

HAB. Shaded rocks, on Grandfather Mountain, North Carolina (*Sullivant*); sterile.

2. **C. Tallulensis,** Sulliv. & Lesq. Tufts yellowish white, glossy outside, brown within; stems simple or dichotomous, sparingly radiculose toward the base: leaves open-erect, close, narrowly lanceolate from a somewhat decurrent not excavated base, concave, serrate at the apex; costa percurrent; basal cells very large, broadly quadrangular, inflated, light brown. — Musc. Bor.-Amer. n. 73[b]; Sulliv. Icon. Musc. 27, t. 17.

HAB. Wet flat rocks, on the river-banks at Tallulah Falls, Georgia.

Compared with the last, it clearly differs in the pale yellowish green color, the exactly linear leaves sub-decurrent and not excavated at the angles, with larger inflated basilar cells, and the costa not entirely filling the leaves at the apex, but bordered by a band of the lamina.

3. **C. introflexus,** Bridel. Plants yellowish green above, brown below; stems short, erect: leaves appressed, erect-open, narrowly lanceolate, canaliculate above, constricted into a long hyaline denticulate hair-point straight or geniculate at base when dry; costa broad, three-fifths of the width of the leaves at base, lamellate on the back; basal cells large, orange-colored, the medial longer, narrower, rectangular and hyaline. — Bryol. Univ. i. 472; Braithw. l. c. 135, t. 19, C. *Dicranum introflexum,* Hedw. Spec. Musc. 147, t. 29. *C. leucotrichus,* Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 73; Sulliv. Mosses of U. States, 19, and Icon. Musc. 28, t. 17.

HAB. Dry sandy rocks, Raccoon Mountains, Alabama (*Lesquereux*).

4. **C. Leanus,** Sulliv. Plants more or less densely cespitose, short, straw-color, tawny below; stems radiculose to the apex, branching by slender capitate fasciculate innovations: leaves crowded, open-erect, rarely subsecund, linear-lanceolate, subulate, not decurrent at base; costa broad, flat; areolation linear-oblong, the cells only slightly larger toward the base, not enlarged at the angles; abortive leaves forming compact tufts of linear thickish fleshy filaments like a deformity produced by

insects. — Mosses of U. States, 19, and Icon. Musc. 29, t. 18. *Syrrhopodon Leanus*, Sulliv. Musc. Allegh. n. 172.

HAB. On much decayed logs or soft woody earth in forest swamps of the Middle States and westward; not common.

5. **C. Hallii,** Lesq. Plants in compact pale green glossy tufts; stems short, 2 c.m. long, many times dichotomous, tomentose to the apex: leaves strict, rigid, linear-lanceolate, tubulose, very entire at the apex, and smooth throughout; costa very broad, covering the whole lamina except two small auricles at base composed of a few colored inflated cells. — Porter & Coult. Flora of Colorado, 155.

HAB. High ridges of the Colorado Mountains (*E. Hall*).

Resembling *C. brevipes* (Schimp. Bryol. Eur. Suppl. *Campylopus*, t. 2), but differing in the broader costa, and the leaves constricted at base into short obtuse auricles with one or two rows of colored cells.

6. **C. frigidus,** Lesq. l. c. Resembles the preceding species in the broad dilated costa, but differs in the longer narrower leaves, slightly denticulate at the apex, open, flexuous when dry, and scabrous on the back; alar cells round.

HAB. Same as the last (*E. Hall*).

7. **C. subleucogaster.** Plants loosely cespitulose, dirty yellow; stems short, slender, simple in the lower part, divided at the apex into short capitate branchlets composing a crispate bristly tuft: lower leaves minute, erect, the comal longer, ovate-acuminate with a flat broad nerve passing up to a gradually narrowed canaliculate subulate strict point, serrulate at the apex; basilar cells large, pellucid, regularly hexagonal, with a few smaller quadrate inflated yellowish ones underneath, the alar numerous, very loose, brownish-colored, pellucid, slightly excavated; perichætial leaves much larger, sheathing or convolute at base, loosely reticulate, with a long-flexuous more coarsely subulate point. — *Dicranum subleucogaster*, Muell. Bull. Torr. Club, v. 50.

HAB. On wet clayey ground; Mobile, Alabama (*Mohr*).

This species differs from the European *Dicranum leucogaster*, Muell., in the more flexuous thicker longer hairy stems, the alar cells whitish and loose, and the others smaller.

8. **C. Donnellii.** Differs from the last in its tawny green color, the leaves more open, subfalcate, longer and more abruptly narrowed, often spinulose-serrate and whitish at the apex, the costa narrower, etc. — *Dicranum Donnellii*, Aust., Coult. Bot.

Gaz. iv. 150. *Dicranum subleucogaster*, Aust. Musc. Appal. Exsicc. Suppl. 1, n. 470.

HAB. Southern Florida; common.

9. **C. Virginicus.** Plants widely cespitose, tawny green; stems short, flexuous, slender, nearly equally foliate: leaves strict, erect-open, abruptly long setaceous-subulate from a subquadrate-ovate base, canaliculate, minutely serrate on the margins; costa broad, striate, scabrous on the back or subserrate at the apex; cells of the areolation oblong and oval, hyaline, rhomboidal-oblong or linear toward the middle, smaller above, the basal much enlarged; some of the apical leaves brittle, truncate from a narrower base, deciduous, more convolute, longer and gradually acuminate, entire and smooth on the back, with cells shorter, hyaline, the basilar scarcely different and the costa not distinct from the lamina. — *Dicranum Virginicum*, Aust., Coult. Bot. Gaz. iv. 150.

HAB. Blackwater Falls, West Virginia (*J. Donnell Smith*).

From the remarks of the author, the slender stems are about 2 m.m. long, the young ones clothed with a delicate entangled white tomentum. About one-half of the expanded portion of the leaves is composed of large hyaline cells; ascending along the costa, these gradually become chlorophyllose and smaller, while toward the margin they become much narrower and longer; the basal cells although much enlarged are not inflated, and there appear to be no true alar cells; the lamina rarely extends to the middle of the subulate portion of the leaf.

10. **C. gracilicaulis**, Mitt. Stems slender, 1 or 2 c. m. long, simple and radiculose in the lower part: lower leaves closely appressed, the upper tufted, longer, spreading, narrowly lanceolate-acuminate from an elliptical base; costa covering a third part of the lamina and distinct to near the apex; borders incurved, slightly denticulate above; lower cells loose, oblong, pellucid, gradually shorter, rhomboidal above; inner perichætial leaves long, convolute at base, abruptly narrowed into a narrow subulate hyaline-denticulate point: capsule immersed in the comal leaves, oval, equal, scabrous at base: calyptra fimbriate. — Journ. Linn. Soc. xii. 83.

HAB. South Florida (*Austin*).

11. **C. angustiretis.** Very like the preceding species in aspect, differing in the lower leaves less appressed, the cells much longer, sublinear, the alar dirty red, much contracted. — *Dicranum angustiretis*, Aust., Coult. Bot. Gaz. iv. 150.

HAB. With the preceding species and probably a variety of it.

Subtribe I. — FISSIDENTEÆ.

Stems frondiform. Leaves distichous, conduplicate below, alate on the back, the upper part expanded into a vertical simple lamina with a percurrent or excurrent costa; areolation small, chlorophyllose. Operculum and peristome as in *Dicranum*.

25. FISSIDENS, Hedw. (Pl. 1.)

Plants simple or sparingly branched. Flowers gemmiform, terminal or axillary. Calyptra cucullate or mitriform. Capsule cernuous or erect. Teeth of the peristome horizontally incurved when dry. Annulus narrow. Spores small, smooth. — *Skitophyllum*, La Pyl.

* *Monœcious. Fruit and flowers terminal, or rarely lateral.*

\+ *Plants less than one c. m. long.*

1. **F. Closteri,** Aust. Plants gregarious, very minute or stemless: male flowers attached to the base: leaves perichætial, the lower very small, broadly ovate-lanceolate, acuminate, the upper at least twice as large, the lanceolate lamina about equal to the ovate-plicate base; costa ending below the apex; areolation quadrate-oblong, equal: capsule oblong-ovate, on a thick pedicel; lid with a long conical beak, entirely covered by the calyptra; teeth long, reflexed; annulus indistinct. — Bull. Torr. Club, v. 21; Sulliv. Icon. Musc. Suppl. 44, t. 29.

Hab. On the ground, near Closter, N.J. (*Austin*).

Smaller than *F. exilis*, its nearest congener, and distinguished by its shorter leaves, the blade almost obsolete.

2. **F. bryoides,** Hedw. Plants small, gregarious: leaves with a lingulate-lanceolate lamina, bordered all around by a pale rounded margin either connivent at the apex with the shortly excurrent costa, or ending below the minutely serrate apex; perigonial leaves broad-ovate at base, erose on the borders below the abruptly narrowed short apical lamina: male flowers in numerous axillary pedicellate buds: capsule erect, oblong-ovate; annulus very narrow, indistinct. — Musc. Frond. iii. 67, t. 29, excluding fig. 10; Bryol. Eur. t. 101; Braithw. Brit. Moss-Fl. i. 71, t. 10, E.

Var. **cæspitans,** Schimp. Plants loosely cespitose, much longer, branching by innovations; lamina narrow, the borders and costa disappearing below the minutely serrulate apex.

HAB. Shaded ground; often covering the earth of flower pots in conservatories; the variety at News River, White Mountains (*Rev. D. D. Allen*).

3. **F. incurvus,** Schwaegr. Plants very slender and small: leaves linear or oblong-lanceolate, apiculate, with a very narrow border vanishing toward the apex; costa terminating below the obscurely erose apex or excurrent in a sharp point: capsule horizontal or oblique, rarely erect, small, oval. — Suppl. ii. 5, t. 49; Bryol. Eur. t. 99; Braithw. l. c. 69, t. 10, C. *Dicranum incurvum,* Web. & Mohr.

HAB. Shaded rocks and on sandstone in streams; not rare.

According to Schimper the species is not distinctly defined. The only essential character is the terminal position of the male flowers. Austin asserted that he had found a form of it with axillary male flowers, which seems to indicate that it is a mere variety of *F. bryoides.*

4. **F. inconstans,** Schimp. Similar to *F. incurvus* in size and aspect; plants generally simple: leaves 8 to 16 pairs, linear-lanceolate, acute; borders narrow, hyaline, continuous to near the slightly serrulate apex; dorsal wing entire, narrowed to the base and there confluent with the pellucid costa, which ends below the apex: flowers synœcious or monœcious, antheridia and archegonia numerous and terminal, without paraphyses, or the male buds axillary in the lower leaves of the fruit-bearing plants: calyptra split to near the apex: capsule cylindric-oval, erect; lid conical, rostellate, nearly erect. — Syn. Musc. (ed. 2), 114. *F. synoicus,* Sulliv. Mosses of U. States, 103.

HAB. San Marcos, Texas (*Wright*).

The author remarks that the species is very inconstant in its mode of fructification, which is sometimes terminal and cladogenous, sometimes axillary, and that the capsule is smaller than in *F. incurvus,* of which it may be a variety. In the Texan specimens we have generally found the flowers terminal and synœcious, but sometimes with axillary buds near the base of the fertile plants. The stems are stronger, the leaves shorter and broader, and the areolation smaller than in *F. incurvus.* It is referred to *F. bryoides* by Braithwaite.

5. **F. limbatus,** Sulliv. Plants small: leaves 8 to 10 pairs, oblong, acuminate, with a thick costa ending below the apex and a pellucid border gradually enlarging from near the apex to

the base of the auricles; areolation minute-subquadrate below, loose and angularly rounded in the lamina: flowers monœcious, the male gemmiform, axillary: capsule unequally oval, subcernuous; teeth split to near the base, much inflexed. — Pacif. R. Rep. iv. 185, t. 1.

HAB. Near San Francisco (*Bigelow*).

Comparable to *F. bryoides*, from which it differs in the cernuous capsule, the deeply split teeth, and especially the pellucid entire margin, which becomes very broad at the base of the auricles.

\+ \+ *Plants of larger size.*

6. **F. crassipes,** Wils. Plants 2 to 4 c. m. long: leaves close, soft, lingulate-acuminate, unequally margined, the border enlarged below to the middle of the auricles, disappearing toward the base and below the slightly crenulate apex; costa thick, subpercurrent: flowers terminal; male buds on basilar branchlets: capsule nearly erect, oblong-oval, strongly constricted below the orifice when dry; lid short-beaked; pedicel thick, reddish toward the base, yellowish above; segments of the teeth distinctly papillose; annulus minute. — Bruch & Schimp. Bryol. Eur. t. 100. *F. incurvus*, var. *crassipes*, Schimp. *F. viridulus*, var. *major*, Wils. Bryol. Brit. 303, t. 53, R.

HAB. On wet rocks; not rare in Europe.

The species is admitted on the authority of Jaeger's *Fissidentaceæ*, n. 77. We have seen no American specimen of it.

7. **F. Floridanus,** Lesq. & James. Plants of about the same size as in the preceding, branching from the base, brown in the lower part, bright green above: leaves densely crowded, the upper slightly scythe-shaped, plicate to above the middle, minutely erose-denticulate at the apex, surrounded below by a somewhat large pale border; costa vanishing below the apex; areolation minute, hexagonal, narrower and less distinct in the lamina, which is prolonged on the back of the auricles and abruptly cut at base: flowers monœcious; the male terminal on somewhat long lateral branches; the perichætium on a short radiculose branch from the middle of the stem, bearing one or rarely two fruits; perichætial leaves loosely areolate, with broad auricles narrowly alate to the middle, abruptly narrowed above into a short lamina: capsule oblong-ovate, cernuous, on a thick reddish pedicel; lid large, long-beaked. — Proc. Am Acad. xiv. 137.

HAB. Florida (*Garber*).

Comparable to *F. osmundoides*, Hedw., from which it differs in the monœcious inflorescence, the serrulate apex of the leaves, and the minute hexagonal areolation.

8. **F. ventricosus,** Lesq. Plants robust, loosely and widely cespitose, nearly black throughout, dark green only at the top of the recent innovations, generally immersed; stems two c.m. long or more, branching from the base, radiculose in the axils of the leaves: leaves close, erect-open, cultriform, plicate and ventricose to the middle, bordered by a thick smooth margin confluent at the apex with the thick costa, which is excurrent into a blunt point or rarely vanishing below it; areolation minute, ovate-quadrate or irregularly polygonal: flowers terminal: calyptra large, cucullate: capsule very shortly pedicellate, subimmersed, erect, obovate, narrowing and confluent into the pedicel, dark green; lid short, conical, obtuse; teeth large, erect: spores large. — Mem. Calif. Acad. i. 7; Sulliv. Icon. Musc. Suppl. 45, t. 30.

Hab. On submerged rocks, Mendocino City, California (*Bolander*).

Species comparable to *F. rufulus*, Bruch & Schimp., from which it differs in the more obtuse thick-margined leaves, etc.

* * *Flowers dicœcious.*

+ *Plants minute.*

9. **F. hyalinus,** Wils. & Hook. Gregarious; stems 2 or 3 m.m. long, simple: leaves 3 or 4 pairs, very soft, oblong-lanceolate, interruptedly narrowly marginate, ecostate, plicate to the middle, with a broad margin gradually narrowed to the base; meshes of the areolation large, hexagonal, hyaline-pellucid: fertile flowers terminal, the male not seen: calyptra subcylindrical, covering the beak of the lid: capsule oblong, erect, enlarged at the orifice, short-pedicellate; teeth reddish, solid, closely articulate. — Journ. Bot. (1841) iii. 89, t. 2; Sulliv. Musc. Alleghan. n. 180, Mosses of U. States 24, and Icon. Musc. 34, t. 21.

Hab. Moist rocky ledges at Bank Lick, near Cincinnati (*T. G. Lea*); clay banks near Painesville, Ohio (*H. C. Beardslee*); very rare.

10. **F. exiguus,** Sulliv. Gregarious, pale green: leaves 4 to 6 pairs, oblong-lanceolate, obscurely short-acuminate, entire, not margined, plicate to the middle; dorsal lamina gradually narrowed and vanishing at base; costa flexuous, subpercurrent: male and female plants similar: flowers terminal: capsule erect,

oblong-oval, narrowed and confluent to the pedicel; lid rostellate; teeth split to the middle. — Musc. Allegh. n. 182; Mem. Am. Acad. n. ser. iii. 60, t. 2, B; Mosses of U. States 24 and 103, and Icon. Musc. 36, t. 23. *F. incurvus*, var. *exiguus*, Aust. Musc. Appal. n. 103.

HAB. On stones in moist and shaded ravines, dry channels of brooks, etc.; common.

11. **F. minutulus,** Sulliv. Size and aspect of the last: leaves 4 to 10 pairs, linear-oblong, lanceolate to the apex, bordered by a narrow margin up to the slightly serrulate apex, the auricles broadly margined, and the dorsal lamina extending to below the middle; costa percurrent: calyptra shorter, scarcely reaching the base of the operculum: capsule oval-oblong; operculum longer-beaked than in the preceding species; teeth dark red, cleft to below the middle into long linear-granulose segments. — Musc. Allegh. n. 183; Mem. Am. Acad. n. ser. iii. 58, t. 2, A; Mosses of U. States, 24, and Icon. Musc. 37, t. 24. *F. bryoides*, Hook & Wils. in Drumm. Musc. Am. (Coll. II.), n. 39 and 40. *F. incurvus*, var. *minutulus*, Aust. Musc. Appal. n. 102.

HAB. Moist rocks in woods; dry channels in woods, on stones.

12. **F. Hallii,** Aust. Size of *F. incurvus*, from which it differs in the crenulate immarginate leaves, the longer-beaked lid, the calyptra not cleft and scarcely descending to the base of the beak, and the dicœcious inflorescence. — Coult. Bot. Gaz. ii. 97.

HAB. Texas (*E. Hall*).

13. **F. Ravenelii,** Sulliv. Leaves 5 to 15 pairs, erect or curved on one side, linear-oblong, acute, close and opaque; auricles prolonged to the middle, broadly marginate and distinctly dentate; lamina and dorsal wing not margined, minutely denticulate; areolation very dense, of minute round-quadrate chlorophyllose cells; costa flexuous, hyaline: flowers terminal; male plants very small, with 2 or 3 pairs of leaves: capsule oblong-erect, equal, of thin texture, minutely papillose; lid enlarged at base, with an inclined beak. — Mem. Am. Acad. n. ser. iv. 171, t. 2, Mosses of U. States 24, and Icon. Musc. 39, t. 25.

HAB. Damp bricks or earth, Santee Canal, South Carolina (*Ravenel*); moist ground, Society Hill, North Carolina (*Curtis*).

14. **F. Donnellii,** Aust. Leaves 3 or 4 pairs, not margined, crenulate-serrate on the borders, papillose, the lower oblong-

ovate, the upper much longer, linear-lanceolate, plicate to the middle; costa vanishing below the apex; cells of the areolation very small, each with a single papilla: pedicel very short: capsule destroyed. — Coult. Bot. Gaz. iv. 151.

HAB. Base of trees in a cypress swamp, Caloosa, Florida (*J. Donnell Smith, Austin*).

15. **F. Garberi,** Lesq. & James. Gregarious; plants simple: leaves 4 to 8 pairs, slightly decurrent, oblong, the upper four times longer than broad, plicate to the middle; dorsal wing gradually narrowed to the base; lamina somewhat broader than the plicate auricle, blunt at the apex, rarely short-acuminate, crenulate on the borders by doubly papillose cells; areolation round-hexagonal, distinct, that of the perichætial clasping base of the vaginule larger, hexagonal-rectangular, in two or three rows: capsule sub-erect, oval, pale brown, red at the orifice; segments of the teeth yellow. — Proc. Am. Acad. xiv. 137.

HAB. On the bark of trees, Florida (*Garber, J. Donnell Smith*).

The inflorescence of this species is not positively ascertained. Schimper, who examined the specimens with James, found it bisexual, while Austin (Bull. Torr. Club, vii. 5), who had specimens from Florida which he considered the same species, describes it as pseudo-dicœcious.

16. **F. Texanus,** Lesq. Plants dark green, turning to black: leaves 5 to 7 pairs, curved at the apex, broadly lanceolate-acuminate, with a thick dark smooth margin ascending to the apex or to near the slightly serrulate point; costa stout, percurrent or excurrent into a short mucro; dorsal lamina broad, descending to the base: male and female plants similar: capsule long-pedicellate, oval, inclined, rarely erect, greenish brown, smooth; lid conical, short-beaked, subincurved. — Herb. Sulliv. (1850).

HAB. Texas (*Wright*).

Related to *F. incurvus*, but differing in the dark color of the plants, the broad dorsal wing descending to the base, the broader leaves, and the dicœcious inflorescence. It differs from *F. Hallii*, Aust., merely in the entire margined leaves.

17. **F. obtusifolius,** Wils. Plants densely gregarious or closely aggregated-cespitulose, bright green, simple or branching: leaves 6 to 12 pairs, erect or turned to one side, very entire, not margined, obovate, obtuse, with a broad nearly round pellucid areolation, plicate to above the middle; dorsal lamina gradually narrowed, ending above the base; costa vanishing below the apex: flowers terminal: capsule thick, oblong-ovate or obovate,

slighty contracted under the broad orifice; lid hemispherical, conical-apiculate; teeth short, orange at base; segments hyaline, whitish and granulose: spores large. — Lond. Journ. Bot. (1845) iv. 196; Sulliv. Musc. Allegh. n. 181, Mosses of U. States, 24, and Icon. Musc. 35, t. 22.

HAB. Frequent on wet dripping sandstone rocks, near the water at the base of dams; near Cincinnati, where it was first found by *Lea;* very abundant at and around Sugar Grove, Ohio.

+ + Plants larger.

18. **F. osmundoides,** Hedw. Plants of medium size, tomentose, dark green, more or less densely tufted: leaves numerous, broadly lingulate, slightly falcate inward, rounded and apiculate at the apex, minutely serrate on the borders; dorsal wing broad, narrowing downward to the base: flowers terminal; male plants smaller: calyptra plurilobate at base: capsule erect or slightly inclined, oval-oblong, brown, solid; lid with a long acicular beak. — Spec. Musc. 153, t. 40; Bryol. Eur. t. 103; Braithw. l. c. 73, t. 11, A. *Conomitrium osmundoides,* Muell. Syn. ii. 526.

HAB. On the ground, the roots and bark of trees, in swamps and peat bogs; plains and mountains.

19. **F. decipiens,** DeNot. Smaller than *F. adiantoides,* which it closely resembles. Leaves dusky green, close, linear-lanceolate, plicate to the middle, minutely serrulate all around except sometimes at the base of the lamina; meshes of the areolation small: male flowers axillary, on separate plants: capsule short-pedicellate, small, sub-erect when empty. — Epil. Bryol. Ital. 479; Schimp. Syn. Musc (ed. 2), 118; Sulliv. Icon. Musc. Suppl. 46, t. 31; Braithw. l. c. 76, t. 11, D.

HAB. On sandy soil and limestone rocks; frequent, but hitherto generally considered as a small form of *F. adiantoides.*

** * * Fruit axillary.*

20. **F. taxifolius,** Hedw. Plants 2 or 3 c.m. long, fasciculate-branching at base: leaves close, lingulate-obtuse, mucronate by the excurrent costa, plicate to the middle, serrate and hyaline on the borders: flowers monœcious, on short basilar radiculose branchlets: capsule subcernuous, inclined or pendent, oblong, slightly inflated on the back, solid, dark brown; pedicel long, flexuous, reddish; lid long, narrowly beaked. — Spec. Musc.

135, t. 39; Bryol. Eur. t. 104; Braithw. l. c. 77, t. 11, D. *Hypnum taxifolium*, Linn.

Hab. Shaded clayey ground in level districts; very common.

21. **F. adiantoides,** Hedw. Plants 3 to 5 c.m. long, branching by radiculose innovations from the base or the apex: leaves numerous, close, imbricate at base, linear-oblong, abruptly acuminate and slightly mucronate, plicate to the middle; dorsal wing long, continuous, slightly decurrent at base; borders pellucid, irregularly serrulate: flowers short-pedicellate, attached to the middle of the stems: capsule oval-oblong, reddish brown, much constricted under the orifice when empty; lid long-beaked. — Musc. Frond. 61, t. 26; Bryol. Eur. t. 105; Braithw. l. c. 78, t. 12, B. *Hypnum adiantoides*, Linn.

Var. **immarginatus,** Lindb. Leaves without a pellucid border.

Hab. Shady moist ground, wet rocks, roots of trees, etc., mostly in the plains; common. The variety at Boundary Lake, Canada (*Rau*).

* * * * *Flowers diœcious or unknown.*

22. **F. subbasilaris,** Hedw. Plants widely cespitose, 1 or 2 c.m. long, green above, brown and tomentose below: leaves 12 to 15 pairs, close, oblong, short-pointed, plicate to above the middle, serrulate, not margined; dorsal wing broad, rounded at the base; costa vanishing below the more deeply serrulate apex: fruiting buds rarely pedicellate, attached near the base, radiculose; male flowers unknown: calyptra cucullate, narrow: capsule oblong or cylindric-oval, erect, subcernuous, scarcely emerging above the stems on its short pedicel; lid long-beaked. — Spec. Musc. 155, t. 39; Sulliv. Musc. Allegh. n. 184, Mosses of U. States, 25, and Icon. Musc. 41, t. 26.

Hab. Trunks of trees, sometimes in dense tufts; Northern and Middle States.

23. **F. polypodioides,** Hedw. Plants of large size, gregarious, radiculose at base, yellowish green, glossy, mostly simple, rigid: leaves numerous, linear-oblong, abruptly rounded to a blunt point, entire, not margined, plicate to above the middle; dorsal wing continuous, rounded to the base; costa thick, nearly percurrent: cells of the areolation irregularly round, pellucid: flowers diœcious, the fertile attached to the upper part of the stems, the male axillary nearer to the base, in separate plants: capsule on a short flexuous pedicel, obovate,

subpyriform, gradually much enlarged at the orifice; lid rostrate from a hemispherical base; teeth broad and long; annulus large, revoluble. — Musc. Frond. iii. 63, t. 27; Sulliv. & Lesq. Musc. Bor.-Am. (ed. 1), n. 27; Sulliv. Icon. Musc. 43, t. 27; Mitten, Journ. Linn. Soc. xii. 585.

Hab. Louisiana (*Drummond*); Florida (*Chapman*); moist rocks, Georgia (*Lesquereux*); sterile.

24. **F. grandifrons,** Brid. Plants large, dark green, fasciculate-branching from the base, rigid or pendent; branches short, radiculose: leaves numerous, equal throughout, thick, composed of multiple layers of cells, with a thick costa vanishing below the apex, rigid, entire, the borders of the auricles only minutely crenulate: flowers axillary; archegonia numerous: fruit unknown. — Musc. Recent. Suppl. i. 170; Bryol. Eur. t. 106.

Hab. Wet limestone rocks near waterfalls; abundant below Niagara Falls; found also in California (*Bolander*), Nevada (*Watson*), etc.

26. CONOMITRIUM, Mont. (Pl. 1.)

Plants slender, filiform, fasciculate-ramose, branching from innovations the whole length of the stems, or from the base only, floating. Leaves distant, linear-lanceolate, short-auriculate. Flowers monœcious, terminal, on more or less elongated branchlets, the male axillary; fruits (cladogenous) on young shoots, often numerous on the same plants. Calyptra minute, conical, solid, covering only the beak of the lid. Capsule short-pedicellate, fragile, erect, very small. Operculum conical-beaked. Teeth laciniate or entire. Annulus none.

1. **C. Julianum,** Mont. Leaves long, the lamina ending at the auricles and three times as long: male flowers sometimes aggregate; perigonium of two or three leaves: calyptra nearly black, erose or lacerate at base: capsule oblong-ovate, greenish, soft, red at the orifice, gradually narrowed to a short green pedicel, very fragile at its base; lid as long as the capsule; teeth short, irregularly laciniate or perforate above the middle, yellowish at base, pellucid. — Ann. Sci. Nat. 2 ser. viii. 250. *Fontinalis Juliana*, Savi. *Octodiceras Julianum*, Brid. Bryol. Univ. ii. 678; Bryol. Eur. t. 108.

Hab. On stones and branches in wooded creeks and swamps.

2. **C. Hallianum,** Sulliv. & Lesq. Plants very small and slender, in loose floating dirty green sparingly divided tufts: leaves distant, long-linear, gradually tapering to a blunt apex; dorsal wing descending to the middle; areolation loose, in broader ovate angular cells, narrower toward the borders: flowers terminal on long branches: calyptra longer, descending to below the orifice of the capsule, split on one side: capsule longer-pedicellate, oval-oblong, with the borders of the orifice flat; lid conical-rostrate, slightly inclined, nearly as long as the capsule; teeth long, entire, not cleft and without a divisural line, narrowly lanceolate, obscurely articulate, yellow, attached at a distance below the orifice. — Aust. Musc. Appal. n. 108; Sulliv. Icon. Musc. Suppl. 43, t. 28.

HAB. On decayed wood in wells, Illinois (*E. Hall*), fertile; on shaded rocks, New Jersey (*Austin*), sterile.

SUBTRIBE II. LEUCOBRYEÆ.

Plants whitish, spongy like *Sphagnum*, soft when moist, brittle when dry, densely cespitose. Leaves close, composed, except on the borders, of two or three superposed layers of large porous chlorophyllose cells separated by a layer of intercellular simple narrow chlorophyllose ones. Calyptra large, whitish. Capsule, peristome and operculum as in *Dicranum*, or the peristome of 8 short broad lanceolate teeth.

27. LEUCOBRYUM, Hampe. (Pl. 2.)

Capsule, peristome and lid as in *Dicranum*. Flowers diœcious.

1. **L. vulgare,** Hampe. Ramification dichotomous and fastigiate: leaves oblong-ovate, half-clasping at base, lanceolate, tubulose from the middle upward: capsule oblong-ovate, with a distinct substrumose collum, slightly gibbous below the orifice, small, chestnut-color, black when old, plicate-furrowed when dry; lid long-subulate-beaked, curved downward. — Linnæa, xiii. 42. *Bryum glaucum*, Linn. Spec. Pl. 1118. *Dicranum glaucum*, Auct. *Oncophorus glaucus*, Bryol. Eur. t. 97 and 98. *Leucobryum glaucum*, Schimp.; Sulliv. Mosses of U. States, 23.

HAB. Roots of trees, mossy damp places in woods, borders of swamps; not rare. Fruiting in winter or early spring.

2. **L. minus,** Sulliv. Plants more slender, scarcely half as long as in the last species: leaves shorter, more crowded: capsule smaller and pedicel shorter. — Mosses of U. States, 24. *L. vulgare*, var. *minus*, Hampe, l. c.

HAB. Roots of trees in swamps, more generally on the ground in dry woods.

Fruiting from June to August, according to latitude. The time of the ripening of the fruit is the most marked difference between this and the preceding species.

3. **L. sediforme,** Muell. Plants with few branches: leaves very short, densely imbricate, subsquarrose, exactly eight-ranked, lanceolate-acute, very concave, entire, margined to above the middle; perichætial leaves much longer and narrower, long-exserted, convolute: capsule long-pedicellate, short, slightly strumose. — Syn. i. 75· Mitten, Journ. Linn. Soc. xii. 111.

HAB. Florida (*E. Palmer*).

28. OCTOBLEPHARUM, Hedw.

Plants densely cespitose. Leaves thick; costa broadly enlarged at base. Calyptra dimidiate. Capsule erect. Teeth of the peristome 8, short, broadly lanceolate, pale yellow, diaphanous.

1. **O. albidum,** Hedw. Stem-leaves coriaceous, recurved when dry, broadly margined, lingulate-oblong, obtuse or apiculate, denticulate at the apex, unequally alate at base: capsule oval, short-pedicellate, erect; lid plane at base, obliquely subulate-beaked. — Musc. Frond. iii. 15, t. 6; Muell. Syn. i. 86; Mitten, Journ. Linn. Soc. xii. 109.

HAB. Florida; not rare.

SUBTRIBE III. CERATODONTEÆ.

Plants cespitose. Leaves linear-lanceolate, subulate, clasping at the base, spreading to every side or distichous, strongly costate to the apex; areolation elongated and pellucid at the base. Capsule ovate, erect or inclined, on a long slender pedicel. Teeth of the peristome bifid to near the base; segments long, equal, strongly articulate, or shorter and irregularly divided.

29. CERATODON, Brid. (Pl. 1.)

Plants dividing by innovations from under the perichætium. Leaves lanceolate, papillose, or nearly smooth in the upper part. Flowers dicœcious. Capsule ovate-oblong, striate, deeply furrowed when dry, subcernuous. Teeth of the peristome cleft into two equal strongly articulate segments, papillose above.

1. **C. purpureus,** Brid. Plants fastigiate, branching, dirty or dark green: leaves carinate, entire, reflexed; borders opaque, nearly smooth; areolation distinct: capsule short-necked, dark red, polished, horizontal, quadrate or pentagonal when old and dry; lid conical, short-beaked; teeth purple; annulus large, revoluble. — Bryol. Univ. i. 480; Bryol. Eur. t. 189, 190; Braithw. Brit. Moss-Fl. i. 173, t. 26, D. *Mnium purpureum*, Linn. Sp. Pl. 1111. *Dicranum purpureum*, Hedw. Spec. Musc. 136, t. 36.

Var. **xanthopus**, Sulliv. Pedicel of the capsule pale yellow or whitish.

Var. **aristatus**, Aust. Leaves narrower, with a long excurrent costa: capsule and pedicel pale colored. — Musc. Appal. n. 117.

Hab. Almost everywhere, and extremely variable. Var. *xanthopus* common in California; the last on sandy barrens of New Jersey (*Austin*).

2. **C. minor,** Aust. Differs from the preceding in the short stem, half a c.m. long, the leaves lanceolate, aristate by the long point of the excurrent costa and serrulate toward the apex, the capsule shorter, the teeth narrower, articulate only from the middle downward and very narrowly margined. — Coult. Bot. Gaz. ii. 89.

Hab. West of Frazer River (*Macoun*).

The author compares it to his var. *aristatus* of *C. purpureus*, which, however, is more robust, has the costa not excurrent into as long a point, and the peristome of typical character. The difference therefore consists especially in the more delicate texture of the peristome.

30. TRICHODON, Schimp.

Plants small, radiculose at base only, subcespitose. Leaves long-subulate from an enlarged sheathing obovate or oblong base, crispate, smooth; areolation linear-rectangular, gradually longer to the base. Flowers dicœcious; perichætium sheathing

Calyptra long, narrow. Capsule narrowly cylindrical, regular or subarcuate, thin, smooth. Operculum short-conical. Peristome large, purple, with the segments of the teeth nearly equal, nodose at the articulations and minutely granulose. Annulus large, revoluble.

Related, like *Ceratodon*, to *Dicranum* in the mode of growth; to *Leptotrichum* in the form of the capsule and structure of the peristome.

1. **T. cylindricus,** Schimp. Stem one c.m. long: leaves flexuous, squarrose, curling: capsule dusky. — Coroll. 36. *Trichostomum cylindricum*, Hedw. Sp. Musc. 107, t. 24, figs. 7 to 13. *Didymodon cylindricus*, Wahl.; Sulliv. & Lesq. Musc. Bor.-Am. n. 106[b] (not Bruch & Schimp.; Watson, Bot. Calif. ii. 366, excl. hab.). *Ceratodon cylindricus*, Bryol. Eur. t. 192. *Ditrichum tenuifolium*, Lindb.; Braithw. Brit. Moss-Fl. i. 97, t. 14, E.

Hab. On old wood and twigs, Chester Co., Pennsylvania, fruiting; Alleghany County and White Mountains, sterile (*James*); Nevada (*Watson*); Ontario (*Mrs. Roy*).

31. DISTICHIUM, Bruch & Schimp. (Pl. 2.)

Plants densely cespitose, glossy. Stems slender, repeatedly dichotomous and fastigiate. Stem-leaves exactly distichous, spreading and subulate from the half-clasping base, broadly costate. Flowers monœcious; antheridia enclosed in a perigonium of two or three leaves, or more generally free in the axils of the upper leaves, long, narrow, with long paraphyses; perichætium terminal. Capsule erect or subcernuous, coriaceous, glossy. Lid conical. Teeth linear-lanceolate, either nearly entire or bifid or irregularly lacerate, punctulate, reddish. Annulus simple, large, deciduous.

1. **D. capillaceum,** Bruch & Schimp. Tufts dense, tomentose, silky green above: leaves long-subulate from the clasping base, broad, concave-oblong, open and flexuous, very entire; perichætium of two long sheathing leaves: capsule generally erect, regular, oblong-ovate, smooth (not furrowed) when dry; teeth narrow, irregular, bifid or lacunose. — Bryol. Eur. t. 193. *Bryum montanum*, Lom. Fl. Fr. i. 48. *Swartzia*

capillacea, Hedw. Musc. Frond. ii. 72, t. 26. *Cynontodium capillaceum*, Hedw.; Mitten, Journ. Linn. Soc. xii. 41. *Swartzia montana*, Lindb.; Braithw. Brit. Moss-Fl. i. 102, t. 15, B.

Hab. Cold and subalpine regions, in fissures of rocks; not rare.

2. **D. inclinatum**, Bruch & Schimp. Differs from the preceding in its soft irregular dark green tufts; the leaves close, shorter, more narrowly subulate and minutely serrate at the apex; the male flowers at the base of the perichætium, which is composed of three sheathing leaves; the capsule cernuous, shorter ovate; and the teeth broader, strongly articulate, bifid or cribrose. — Bryol. Eur. t. 194. *Swartzia inclinata*, Hedw. Musc. Frond. ii. 74, t. 27; Braithw. l. c. 103, t. 15, C.

Hab. Northern shore of Lake Superior (*Agassiz*); Rocky Mountains (*Drummond*); Colorado (*Downie*); Uinta Mountains (*Watson*); Sierra Nevada (*Bolander*).

Trichostomum (?) *scitulum*, Austin (Coult. Bot. Gaz. i. 29), described as small with slender stems, the leaves distichous, erect, subsheathing at base, spreading and undulate, abruptly linear-canaliculate, scabrous and papillose, erose-serrate at the apex, is apparently a form of this species. The description is made from sterile plants found on dry shaded limestone rocks at the zinc mines of Odenburg, New Jersey. The author remarks that the leaves are much like those of *Distichium inclinatum*, but they are more undulate-flexuous, less solid, not so acute, and the papillæ of the surface are larger.

32. EUSTICHIA, Brid. (Pl. 2.)

Plants with the aspect of *Fissidens*, more or less densely gregarious; stems simple, rarely forking, flat, radiculose and bulbiform at base. Leaves distichous, densely imbricate, carinate-plicate, erect, smooth, glossy; costa thick, compressed toward the base into a narrow lamina, more enlarged toward the apex, percurrent or vanishing below the apex in the stem-leaves, passing in the floral leaves into a long flexuous lorate acumen; areolation oblong-elongated, hyaline below, quadrate-hexagonal and chlorophyllose above. Flowers dicœcious, terminal, gemmiform; antheridia and archegonia long, slender, with few short piliform paraphyses. Calyptra cucullate. Capsule oval or obovate, on a short flexuous pedicel. Lid flat, convex when moistened, obliquely and narrowly rostrate. Peristome none.

1. **E. Norvegica,** Brid. Plants one or two c.m. long, subflexuous: leaves short-acuminate; costa vanishing at or below the apex; perigonium of three concave lorate-acuminate leaves; perichætium distichous, the lower leaves shorter, the upper and inner ones very long-acuminate, obscurely serrate at the apex: calyptra large, cuculliform, split three-fourths of its length, tipped with a long slender flexuous awn as long as the calyptra: capsule obovate, pale yellow, red-bordered at the orifice, oblique or inclined horizontally upon a comparatively thick pedicel (2 m.m. long); lid red at its base, long-persistent, attached to the columella and bearing at the borders fragments of the inner membrane lacerated in its dehiscence. — Bryol. Univ. ii. 674; Bryol. Eur. t. 195; Sulliv. Mosses of U. States, 29; E. G. Knight, Bull. Torr. Club, x. 99, figs. 1-6. *Phyllogonium Norvegicum*, Sulliv. Musc. Allegh. n. 46, and Mem. Amer. Acad. n. ser. iii. 57, t. 1. *Bryoziphium Norvegicum*, Mitten, Journ. Linn. Soc. xii. 580.

Hab. Not rare on the shaded vertical face of sandstone rocks in the coal measures of Middle Ohio and Kentucky, sterile. Found fertile only (July, 1883) in similar situations on rocks of the Potsdam sandstone in the dells of the Wisconsin River near Kilbourn City, Wisconsin, by Miss Elizabeth G. Knight.

Two species only of this genus are known. The second, *E. Savateri*, Husnot (Revue Bryol. v. 85), is from Japan, and has also been found in fruit. It differs merely in the shorter and broader stem-leaves, abruptly round-truncate and denticulate at the apex, and cuspidate by the excurrent rough thick pointed costa. The pedicel is of the same length and character; the deoperculate capsule is oval. The calyptra and the operculum have not been seen.

Subtribe IV. SELIGERIEÆ.

Plants minute, rarely of large size, gregarious or densely cespitose. Leaves open, narrow, lanceolate or subulate, costate; cellules of the areolation minute, quadrate, larger at the base, smooth. Flowers gemmiform. Calyptra cucullate, smooth, entire or 3–5-lobate at base. Capsule erect, subspherical, with a distinct collum, gymnostome or with a peristome of 16 lanceolate acute or obtuse or truncate smooth flat teeth.

33. ANODUS, Bruch & Schimp.

Plants very short, gregarious, simple. Leaves lanceolate-subulate, minutely serrate. Flowers monœcious, without paraphyses. Capsule erect, subturbinate, distinctly short-necked, soft, thin, gymnostome, macrostome and exannulate; pedicel straight, comparatively long. Operculum large, short-beaked.

1. **A. Donianus,** Bruch & Schimp. Leaves deeply canaliculate, with a strong continuous nerve mostly composing the apex; basilar cells of the areolation rectangular, empty, the upper quadrate, small, chlorophyllose. — Bryol. Eur. t. 109. *Gymnostomum Donianum*, Smith, Engl. Bot. t. 1582. *Seligeria Doniana*, Muell. Syn. i. 420; Braithw. Brit. Moss-Fl. i. 116, t. 16, G.

Hab. Limestone rocks, Little Falls, New York (*C. H. Peck*); Owen Sound, Canada (*Macoun*).

34. SELIGERIA, Bruch & Schimp. (Pl. 1.)

Plants slightly more robust than in the last genus. Lower leaves very small, distant, the upper abruptly tufted and much longer, entire; costa stronger upwards, semi-terete or canaliculate. Capsule subglobose, of thick texture, tumid at the collum, turbinate when empty. Lid large at the base, subulate-beaked. Peristome of 16 broad solid teeth, linear-lanceolate, obtuse or pointed, free to the base, smooth, orange, without dividing lines, inflexed when moistened, reflexed when dry.

1. **S. pusilla,** Bruch & Schimp. Plants very small, soft, bright green, loosely cespitose: lower leaves narrowly lanceolate, the upper long, narrowly linear from a broader concave base; costa slender, vanishing below the apex, translucent; borders nearly entire, very narrow, distinct to near the apex; perichætial leaves half-clasping at base, lanceolate, subulate above: male flowers terminal on separate branches or sessile under the perichætium: capsule ribbed when dry, on a comparatively long strict yellowish pedicel; lid oblique, subulate-beaked. — Bryol. Eur. t. 110; Sulliv. Mosses of U. States, 80; Braithw. Brit. Moss-Fl. i. 117, t. 16, H. *Weisia pusilla*, Hedw. Musc. Frond. ii. 78, t. 29.

HAB. Shaded limestone rocks, St. Louis, Missouri (*Drummond*); Devil's Hole, near Niagara Falls (*G. W. Clinton*); New Jersey (*Austin*); Kelly's Island, Lake Erie (*Lesquereux*).

2. **S. calcarea,** Bruch & Schimp. Differs from the preceding in the shorter and broader leaves, the lower lanceolate, the upper ovate, oblong at base, concave, abruptly narrowed to a subulate blunt apex, the costa flat, enlarged upward and filling the whole width of the lamina; capsule larger, more solid, with the beak of the lid shorter, and the teeth broader and more densely articulate: spores larger. — Bryol. Eur. t. 110; Braithw. l. c. 120, t. 17, B. *Bryum calcareum*, Dicks. Pl. Crypt. *Weisia calcarea*, Hedw. Spec. Musc. 66, t. xi.

HAB. Limestone rocks, Owen Sound, Canada (*Macoun*).

3. **S. recurvata,** Bruch & Schimp. Plants widely cespitose, very short: upper leaves oval-lanceolate at base, canaliculate above, long-subulate by the excurrent costa, entire; perichætial leaves sheathing, tubulose at base, lanceolate-subulate, flexuous above: capsule subglobose, inflated at the collum, thin, loosely areolate, red at the orifice; pedicel long, yellowish, arcuate when moistened, erect when dry; lid straight, subulate-beaked; teeth linear, obtuse or lanceolate, sometimes irregularly bifid at the apex. — Bryol. Eur. t. 112. *Grimmia recurvata*, Hedw. Musc. Frond. i. 102, t. 38. *S. setacea*, Lindb.; Braithw. l. c. 121, t. 17, C.

Var. **arcuata.** Leaves shorter; pedicel slightly arched. — *Weisia Seligeri*, Hook. & Wils. in Drumm. Musc. Am. n. 66.

HAB. Devil's Hole, Niagara (*Clinton, Mrs. Roy*); limestone rocks, Easton, Penn. (*James*); the variety on the molasse of Lake Winnipeg (*Drummond*).

4. **S. tristicha,** Bruch & Schimp. Plants rigid and cespitose, short, branching: leaves distinctly three-ranked, close, rigid, elliptical, whitish at base, narrowly linear to the blunt apex; perichætial leaves longer, subulate and recurved at the apex; costa excurrent: capsule as in the preceding species; beak of the lid inclined, orange-colored; teeth a little narrower. — Bryol. Eur. t. 111. *Weisia tristicha*, Brid. Spec. Musc. 116. *S. trifaria*, Lindb.; Braithw. l. c. 118, t. 16, K.

HAB. Limestone rocks, in shaded ravines, Central Ohio (*Sullivant*); very rare.

Distinguished from the two preceding species by its black color and the three-ranked arrangement of the leaves.

35. BLINDIA, Bruch & Schimp.

Plants of larger size, densely cespitose, branching by innovations from under the apex, fastigiate when old. Leaves crowded, open or secund, broadly lanceolate at base, subulate, canaliculate and costate to the apex, glossy; areolation narrow, quadrate toward the apex, linear at base, enlarged and orange-colored at the basilar angles. Flowers dicœcious; perichætium sheathing. Calyptra large, covering the capsule to the middle. Capsule exserted on a long or short pedicel, subglobose, solid, inflated at the collum; peristome of 16 equidistant lanceolate teeth, entire or perforated or bifid at the apex, purple, erect when dry, arcuate and connivent when moistened, distantly articulate.

1. **B. acuta**, Bruch & Schimp. Tufts olive or yellowish green; plants variable in size, one to fifteen c.m. long, the slender stem mostly naked in the lower part. — Bryol. Eur. t. 114; Braithw. Brit. Moss-Fl. i. 124, t. 17, F. *Weisia acuta*, Hedw. Musc. Frond. 85, t. 35. *Grimmia acuta*, Smith, Engl. Bot. t. 1644.

HAB. On wet rocks, Rocky Mountains (*Drummond*); Cauterskill River, New York (*Lesquereux*); White Mountains (*James*); Oregon (*Hall*).

36. BRACHYODUS, Fuernr.

Plants very small, densely gregarious. Leaves lanceolate, subulate, tufted, with a semiterete excurrent costa; areolation minute and quadrate toward the apex, rectangular-hexagonal and smooth in the lower part. Flowers monœcious, terminal; antheridia without paraphyses. Calyptra erect, conical, five-lobate at base, split on one side to near the apex. Capsule gradually enlarged from the top of the pedicel, erect, oblong, soft, substriate; lid convex at base, abruptly long-subulate, crenulate on the borders. Teeth of the peristome hyaline, punctulate, sometimes perforate, confluent at base, broad and truncate, rarely lanceolate, entire. Annulus compound, very large, persistent.

Schimper (Syn. Musc. ed. 2, 132) calls this genus paradoxical, but considers it more related to the *Seligeriæ* than to any other. Another species (*B. flexisetus*, Hampe) is found in the Andes of South America.

1. **B. trichodes**, Fuernr. Plants simple: lower leaves small, obscurely cordate, the upper much longer, subulate from the ovate concave base: capsule deeply wrinkled lengthwise when old; pedicel twisted to the left in the upper part, to the right in the lower. — Regensb. Flora, x., Beil. 112; Nees & Hornsch. Bryol. Germ. ii. 2. 5, t. 25; Bryol. Eur. t. 115. *Gymnostomum trichodes*, Web. & Mohr, Bot. Tasch. 85. *Brachydontium trichodes*, Fuernr.; Braithw. Brit. Moss-Fl. i. 122, t. 17, D.

HAB. On trap dykes, Tuckerman's Ravine, Mount Washington (*O. D. Allen*).

37. CAMPYLOSTELEUM, Bruch & Schimp.

Plants densely gregarious, very short, delicate. Leaves subulate; areolation minutely quadrate and chlorophyllose in the upper part, hexagonal, rectangular and hyaline in the lower. Capsule of thin texture, on a slender geniculate or arcuate pedicel. Teeth of the peristome 16, lanceolate-subulate, split to the middle or to the base. Annulus broad, compound, revoluble. Spores very small.

This genus is placed by Lindberg and Braithwaite with *Glyphomitrium* and *Coscinodon*.

1. **C. saxicola**, Bruch & Schimp. Stem radiculose at base: lower leaves minute, lanceolate, the upper densely tufted, long-linear, subulate from the lanceolate base, concave, slightly recurved when moistened, subcrispate when dry; costa thick, percurrent; perichætial leaves enlarged, concave at base, narrower upward: flowers monœcious; male buds on a short basilar branch: capsule oblong, cylindrical, oval, pale red at the orifice, declined on a long very slender pale geniculate pedicel; lid with a very long subulate beak; teeth reddish at base, pale and punctulate at the apex of the narrow linear segments. — Bryol. Eur. t. 116. *Dicranum saxicola*, Web. & Mohr, Bot. Tasch. 167. *Campylopus*, Brid. *Grimmia geniculata*, Schwaegr. Suppl. i. 82, t. 22. *G. saxicola*, Hook. Engl. Bot. Suppl. t. 2627.

HAB. On erratic rocks, Massachusetts (*R. C. Ingraham*); sandstone rocks, Kentucky (*Lesquereux*).

Tribe III. POTTIEÆ.

Plants generally perennial; innovations fastigiate; areolation parenchymatous, quadrate-hexagonal in the upper part, more or less papillose, very chlorophyllose, dilated and hyaline toward the base. Calyptra cucullate, rarely mitriform-lobate, smooth. Capsule generally erect, symmetrical. Peristome simple, rarely absent, of 16 teeth, either rudimentary, flat and membranaceous, or more generally perfect, often split to the base into 32 round filiform indistinctly articulate segments.

38. PHAROMITRIUM, Schimp.

Capsule immersed, globose, without peristome, enlarged at the orifice after the falling of the lid, soft, loosely areolate. Calyptra oblique, plurilobate.

1. **P. subsessile**, Schimp. Plants short, cespitose: leaves obovate-oblong, acuminate, with a round costa passing up into a long pellucid hair-point, bearing in the middle two to four follicles filled with a granulose mucilaginous mass, often divided into two to four lamellæ: flowers monœcious; anthers paraphysate in the axils of a single perigonial leaf near the base of the perichætium: capsule on a short erect pedicel; lid large, plano-convex at base, abruptly narrowed into a short slender and erect or inclined beak; annulus none. — Syn. Musc. 121. *Schistidium subsessile*, Brid. *Pottia subsessilis*, Bruch & Schimp., Bryol. Eur. t. 117.

Hab. On sandy or clayey ground, stone walls, etc.; plains and mountains; not rare.

Variable in size, from one or two m.m. to four c.m. or more in length; borders of the leaves generally entire near the apex, sometimes with a few distinct teeth. *Pharomitrium exiguum*, Austin (Bull. Torr. Club, vi. 42), mere buds or young plants with scarcely any stems, and with the borders of the leaves denticulate at the apex, is a variety which is found also among European specimens.

39. POTTIA, Ehrh. (Pl. 2.)

Sparingly branching from the base or simple. Leaves ovate-oblong, acuminate, soft, opaque, smooth or papillose; costa

round, rarely lamellose toward the apex. Capsule erect. Peristome either none or very imperfect, or composed of 16 flat teeth.

* *Capsule without peristome or nearly so.*

1. **P. cavifolia,** Ehrh. Leaves ovate-oblong, very concave, long-aristate by the excurrent lamellate costa: capsule exserted, ovate-oblong. — Beitr. i. 187; Bryol. Eur. t. 118. *Gymnostomum ovatum,* Hedw. Musc. Frond. i. 15, t. 6. *Pottia pusilla,* Lindb. Trichost. 218.

HAB. On naked ground; Platte River, at base of the Rocky Mountains (*E. Hall*); Fort Colville (*Lyall*); near Carson City, Nevada (*Watson*).

The leaves are sometimes scarcely aristate and the plants in loose tufts, sometimes with a very long white hair and the plants very densely cespitose.

2. **P. minutula,** Fuern. Plants minute, annual: leaves open, ovate and oblong-lanceolate, cuspidate by the excurrent brown costa, recurved on the borders, minutely papillose on the back, reddish when old: anthers naked in the axils of perichætial or in buds composed of two small perigonial leaves: capsule minute, ovate, truncate; lid broad, short, conical-obtuse. — Regensb. Flora, xii, Erg.-bl. 10; Bryol. Eur. t. 119. *Gymnostomum minutulum,* Schwaegr. Suppl. i. 25, t. 9. *P. Starkei,* var. *gymnostoma,* Lindb. Trichost. 219.

HAB. Los Angeles, California (*Bigelow*); very rare in America, common in Europe.

3. **P. truncata,** Fuern. l. c. Plants small and simple, or longer and ramose, gregarious or subcespitose: leaves open, oblong or obovate, acuminate and mucronate by the excurrent costa, soft, loosely areolate, concave, flat on the borders, nearly smooth: capsule broadly ovate, truncate or subcylindrical, gymnostome; lid plano-convex, obliquely rostellate, attached to the columella and falling with it. — Bryol. Eur. t. 120, 121. *Bryum truncatulum,* Linn. Spec. Pl. 1119. *Gymnostomum truncatum,* Hedw. Musc. Frond. i. 13, t. 5. *P. eustoma,* Ehrh. Beitr. i. 187.

HAB. Open ground; New England to Pennsylvania.

4. **P. Wilsoni,** Bruch & Schimp. Plants simple, loosely cespitose: leaves close, gradually larger upwards, open, erect, oval-oblong or ovate-spathulate, rounded at the apex and cuspi-

date by the excurrent yellowish costa, plano-concave, with borders slightly recurved, green, chlorophyllose and verrucose in the upper part, loosely areolate and hyaline toward the base: antheridia paraphysate, axillary: calyptra tawny and scabrous at the apex: lid obliquely rostrate from a convex base: peristome composed of a basilar papillose membrane with an irregular margin sometimes cut into rudimentary teeth; annulus simple. — Bryol. Eur. t. 122. *Gymnostomum Wilsoni*, Hook. Bot. Misc. i. 143, t. 41; Wils. Suppl. Engl. Bot. t. 2710. *P. truncata*, var. *subcylindrica*, James, Bot. King Exp. 399.

Hab. Meadows near Carson City, Nevada (*Watson*).

5. **P. Heimii,** Fuern. l. c. Plants more robust, variable in length, cespitose: leaves open, flexuous, the lower distant, broadly lanceolate, the upper longer, close and tufted, lanceolate-acuminate, serrulate at the apex; costa subpercurrent: flowers synœcious or in separate terminal buds: calyptra large, smooth: capsule obovate or oblong, truncate, solid, brown; lid obliquely rostrate from a plano-convex base, attached to the exserted columella and deciduous with it. — Bryol. Eur. t. 124; Muell. Syn. i. 551. *Gymnostomum Heimii*, Hedw. Musc. Frond. i. 80, t. 30.

Hab. Ditches near Soda Springs, on the Upper Tuolumne, California (*Bolander*); mountains of Utah and Nevada (*Watson*); Colorado and the Rocky Mountains of British America; not rare.

6. **P. riparia,** Aust. Plants short, widely cespitose, dirty green: leaves narrowed to the half-clasping base, subspatulate, rounded or lanceolate with a short acumen, more or less distinctly denticulate, plane on the borders; costa stout, vanishing below the apex: flowers diœcious (?) (male plants unknown): capsule comparatively long and narrow, cylindric-oblong, erect or slightly cernuous; lid conical, mamillate; columella long, emerging, attached to the lid; annulus large, compound. — Musc. Appal. n. 112; Sulliv. Icon. Musc. Suppl. 34, t. 21.

Hab. On moist rocks along streams; Palisades of Southern New York and New Jersey, rarely fertile (*Austin*).

7. **P. Barbula,** Muell. Plants stemless, budding, gregarious or subcespitose, simple: leaves few, close together, slightly twisted, oblong-lanceolate, the lower acuminate, the upper blunt at the slightly crenulate apex: flowers diœcious, termi-

nal; perigonial leaves four, small, oval or cordate: capsule erect or slightly curved, narrowly cylindrical, annulate; lid conical-subulate. — Syn. i. 558. *Gymnostomum Barbula*, Schwaegr. Suppl. ii. 77, t. 175. *Hyophila Barbula*, Hampe, Bot. Zeit. iv. 267.

HAB. Limestone rocks, Key West (*Garber*); a Cuban species.

* * *Capsule with a distinct peristome.*

8. **P. Starkeana,** Muell. Plants minute, subcespitose, annual, simple: leaves tufted, oblong-lanceolate, concave, reflexed on the borders, papillose in the upper part, shortly mucronate by the excurrent costa: flowers monœcious; antheridia without paraphyses in the axils of comal leaves: capsule very small, oval-oblong, chestnut-color, glossy: lid short, conical, obtuse; teeth plane, truncate or obtuse, with three or four articulations, entire or perforated here and there, pale yellow, papillose; annulus simple, persistent. — Syn. i. 547. *Weisia Starkeana*, Hedw. Musc. Frond. iii. 83, t. 34. *Anacalypta Starkeana*, Fuern. l. c. 25; Nees & Hornsch. Bryol. Germ. ii. 139, t. 36; Bryol. Eur. t. 125.

HAB. On the ground, Mission Dolores, California (*Bolander*); Utah (*Watson*).

The leaves, cuspidate by the excurrent costa, and the presence of an annulus and peristome separate this species from *P. minutula*, which it much resembles.

9. **P. latifolia,** Muell. Plants short, bulbiform, branching from the base, gregarious or loosely tufted, whitish green: leaves imbricate in buds, the lower rounded, the upper round-spatulate, nearly emarginate and abruptly apiculate; costa vanishing below the apex; perichætial leaves narrower, obtuse, all very concave, nearly diaphanous; upper areolation short, oval, slightly chlorophyllose, the lower more enlarged, hexagonal-rectangular: male flowers in separate buds near the base of the fertile plants: capsule oval-oblong, erect, rarely subcernuous; lid rostellate, oblique; teeth lanceolate, irregularly bifid above the middle, enlarged and united at base by a narrow membrane, yellow, minutely papillose; annulus narrow, persistent. — Syn. i. 549. *Weisia latifolia*, Schwaegr. Suppl. i. 64, t. 18. *Anacalypta latifolia*, Fuern. l. c.; Nees & Hornsch. Bryol. Germ. ii. 135, t. 36; Bryol. Eur. t. 128. *P. pilifera*, var. *mutica*, Lindb.

Var. **pilifera,** Muell. Apex of the leaves prolonged into a flexuous hair. — *Bryum piliferum*, Dicks. Pl. Crypt. iv. 10. *Pottia pilifera*, Lindb. Trichost. 223.

Hab. Naked ground in alpine districts; Colorado (*Downie, Wolf, Rothrock*); Uinta Mountains (*Watson*); British America (*Drummond*).

40. DIDYMODON, Hedw. (Pl. 2.)

Plants repeatedly dichotomous, fastigiate, radiculose at base. Areolation of the leaves narrower than in the preceding genus, hyaline at base, chlorophyllose and densely papillose in the upper part. Flowers polygamous and dicœcious, gemmiform. Calyptra long, cucullate. Teeth of the peristome plane, slender, linear-lanceolate, confluent at base, nearly entire or split either partly or sometimes their whole length, distantly articulate, punctulate, not papillose, often irregular. Annulus distinct.

Distinguished from *Trichostomum* by the peristome composed of a flat double lamina, and by the softer and more papillose leaves.

1. **D. rubellus,** Bruch & Schimp. Plants in reddish tufts, slender, about two c.m. long: leaves erect at base, open, flexuous above, crispate when dry, the lower lanceolate, shorter, the upper linear-lanceolate, acuminate, half-clasping at base, the borders revolute above, minutely papillose on both faces; costa narrow, percurrent; perichætial leaves with a longer clasping hyaline very thin base: capsule oblong-cylindrical, of thin texture, dusky green when filled; lid short or long-rostrate, inclined; teeth linear, more or less strongly articulate, entire or perforated along the divisural line, soft, pale red; annulus large, fragile. — Bryol. Eur. t. 185. *Bryum rubellum*, Hoffm. *Weisia recurvirostris* and *curvirostris*, Auct. *Trichostomum rubellum*, Rabenh.; Muell. Syn. i. 581; Lindb. Trichost. 226.

Hab. On stones or on the ground, on or near the water; plains and mountains; not uncommon on both the eastern and western slopes.

2. **D. luridus,** Hornsch. Dicœcious: tufts green when moist, dirty brown when dry, half to one c.m. long, simple or sparingly branching: leaves open when moistened, imbricate when dry, the lower broadly ovate-lanceolate, the upper longer, ovate at base, lanceolate above, blunt or acute, concave, with borders reflexed and surface nearly smooth; costa stout,

vanishing with or below the apex; areolation distinct, rectangular, a little enlarged in the lower part; perichætial leaves erect, similar, with a loose areolation: lid conical, acuminate or blunt, inclined or erect, variable in length; teeth irregular, simple or variously divided, sometimes rudimentary; basilar membrane none; annulus very narrow, persistent. — Spreng. Syst. iv. 173; Bryol. Eur. t. 186. *Trichostomum luridum*, Spruce; Lindb. Trichost. 226.

Var. **cuspidatus**, Schimp. Leaves cuspidate by the excurrent nerve.

HAB. Niagara Falls (*Drummond, Clinton*); Minnesota (*Lapham*); abundant on limestone rocks washed by spray, northern shores of Kelly Island, Lake Erie (*Lesquereux*).

3. **D. cylindricus**, Bruch & Schimp. Dicœcious: loosely cespitose, pale green: leaves long, open, flexuous, linear-acuminate, twisted when dry, whitish at the base, fragile, flat, opaque-verruculose above, minutely crenulate on the borders, or with a few distinct teeth near the apex; costa narrow, excurrent into a short point: capsule narrowly cylindrical, on a long pale soft pedicel; lid long-rostrate, subulate; teeth narrowly linear-lanceolate, entire or diversely lacerate-perforate, fugacious; annulus narrow, persistent. — Bryol. Eur. t. 187. *Weisia cylindrica*, Bruch; Brid. Bryol. Univ. i. 806. *Weisia tenuirostris*, Hook & Tayl. Musc. Brit. (2 ed.) 83, t. 3, Suppl. *Trichostomum tenuirostre*, Lindb. Trichost. 225.

HAB. On old wood and twigs, Chester Co., Pennsylvania, and in the Alleghany, Catskill and White Mountains (*James*); Ontario, Canada (*Mrs. Roy*); rarely fertile.

41. LEPTOTRICHUM, Hampe. (Pl. 1.)

Plants slender. Leaves smooth, lanceolate-subulate; areolation narrowly rectangular above, looser hexagonal-rectangular below. Capsule oval or cylindrical, erect, on a long straight rarely flexuous pedicel. Teeth of the peristome cleft to the base into two linear articulate segments, erect or a little inclined to one side, purple. Annulus compound, deciduous.

* *Flowers dicœcious.*

1. **L. tortile**, Muell. Plants short: leaves secund or spreading, lanceolate-subulate; borders recurved in the middle; costa

excurrent, serrate at the apex: calyptra descending to the middle of the capsule: capsule narrowly oblong or cylindrical, erect or slightly curved, regular; lid short-beaked; teeth attached to a somewhat large basilar membrane, mostly free but sometimes partly connate in the upper part, very variable, nodulose, more or less distinctly papillose. — Syn. i. 454. *Trichostomum tortile*, Schrad.; Bryol. Eur. t. 179; Sulliv. Mosses of U. States, 26.

Var. **pusillum**, Schimp. Plants and capsules smaller; leaves ovate, concave at base, subulate. — *Trichostomum pusillum*, Hedw. Musc. Frond. i. 78, t. 28. *Leptotrichum pusillum*, Hampe, Linnæa, xx. 74.

Hab. Sandy and gravelly ground, by roadsides, and in open fields in hilly districts; the variety near Philadelphia (*James*).

Trichostomum tenue, Hedw. (Spec. Musc. 107, t. 24), collected by *Muhlenberg* at Lancaster, Pennsylvania, still remains an uncertain species, of which nothing is known but from Hedwig's description and figure. It differs from *L. tortile* in its large double annulus, the more solid brownish-red capsule, and the plane margin of the leaves.

2. **L. vaginans.** Differs from the preceding species in its slender slightly longer stems, a longer sheathing perichætium, whose imbricate leaves are gradually narrowed or lanceolate-subulate to a shorter blunt apex, the narrower capsule, the larger annulus, and the smooth strongly articulate or nodose teeth. — *Trichostomum pusillum*, var., Hook & Wils., Drumm. Musc. Amer. (Coll. II.), n. 60 and 61. *T. vaginans*, Sulliv. Musc. Allegh. n. 176, Mosses of U. States, 26, and Icon. Musc. 43, t. 28. *T. tortile*, var. *pusillum*, Muell. Syn. i. 454, in part.

Hab. Clayey and sandy soil in the Middle States; not rare.

Trichostomum nodulosum, Aust. (Bull. Torr. Club, vi. 74), is merely a variety of this species, as the only character indicated by the author as specific is the peristome, which is smooth in his species, and which he asserts to be papillose in *L. vaginans*, contrary to Sullivant's description and figures. The last species is itself separated with great difficulty and uncertainty from *L. tortile*, which has the annulus a little narrower, though compound, and the segments of the teeth (says Schimper) very minutely papillose. That this last character is casual is proved by the fact that in his observations in co-operation with Mr. Sullivant, the writer always found the peristome of the species smooth and even shining, while Austin has found it papillose. In my opinion this *L. vaginans*, though admitted by Schimper, is a mere form of the very variable *L. tortile*. — (*Lesq.*)

3. **L. homomallum,** Hampe. Plants loosely cespitose, bright green, short, about two c.m. long: leaves open or turned to one side, ovate, concave at base, abruptly subulate; costa stout, excurrent into a long very entire point; perichætial leaves with a long clasping base, abruptly and narrowly setaceous-subulate: capsule oblong-ovate or elliptical, thick-walled, reddish; lid short, conical; teeth without a basilar membrane, the segments free or partly united, dark red; annulus broad, compound, revoluble. — Linnæa, xx. 74; Schimp. Syn. 141. *Didymodon homomallus*, Hedw. Spec. Musc. 105, t. 23. *Trichostomum heteromallum*, Bruch & Schimp. Bryol. Eur. t. 181.

HAB. On the ground, west side of the Rocky Mountains (*Drummond*, n. 119); roadsides, etc., in the White Mountain region, common (*Austin*).

4. **L. flexicaule,** Hampe, l. c. Stems long, slender, radiculose, soft, yellowish or dirty green, repeatedly divided by innovations: leaves open or turned to one side or even falcate, lanceolate, long-subulate, the excurrent costa denticulate at the apex: capsule long-pedicellate, small for the size of the plants, ovate or elliptical-oblong, regular or slightly curved; lid narrowly conical, erect; teeth unequal, with free slender fragile segments. — *Cynodontium flexicaule*, Schwaegr. Suppl. i. 113, t. 29. *Trichostomum flexicaule*, Bruch & Schimp. Bryol. Eur. t. 180.

Var. **densum,** Schimp. Plants shorter, in compact tufts: leaves erect, shorter. — Syn. 145.

HAB. On shaded limestone rocks in subalpine regions; British America (*Drummond*); Cascade River (*Lyall*); Placer River Cañon (*Macoun*); Alaska (*Rothrock*).

* * *Flowers monœcious.*

5. **L. pallidum,** Hampe, l. c. Plants short, loosely cespitose, pale or yellowish green: leaves open, erect, spreading or curved to one side, lanceolate at base, very narrowly subulate, the long excurrent costa distinctly denticulate: male flowers gemmiform in the axils of the comal leaves: capsule ovate-oblong, reddish, on a very long pale yellow pedicel; lid conical, short-beaked; teeth divided into unequal segments, free or connate at the articulations, dark purple, twisted when dry. — *Trichostomum pallidum*, Hedw. Musc. Frond. i. 71, t. 27; Bryol. Eur. t. 183; Sulliv. Mosses of U. States, 26.

HAB. On bare sandy or clayey soil in woods; common.

6. **L. Schimperi,** Lesq. Plants subcespitose, nearly simple, short, yellowish green: leaves open, flexuous or falcate-secund, oblong at base, abruptly and narrowly long-subulate, denticulate at the apex only, nearly filled in the upper part by the costa; perichætial leaves sheathing at base, the inner tubulose, long-subulate: flowers gemmiform, narrow, axillary: capsule oblong, erect, cylindrical, robust, yellowish brown, with a shorter thick pedicel; lid longer than in the preceding species, dark red, blunt at the apex; teeth attached to a large orange fugacious basilar membrane, slender, pale yellow, linear, irregularly divided, the segments broad, trabeculate (not articulate), lacerate or perforated; annulus simple: spores very large. — Mem. Calif. Acad. i. 9; Sulliv. Icon. Musc. Suppl. 37, t. 24.

Hab. Coast Ranges of California, near Mendocino City (*Bolander*).

This species has the aspect of the last, but is easily recognized by its greenish color, the shorter broader solid capsule on a shorter thick pedicel, the longer dark red operculum, the much longer leaves, larger basilar areolation, and especially the peculiar characters of the peristome.

7. **L. glaucescens,** Hampe, l. c. Plants cespitose, soft, glaucous; stems dichotomous or fastigiate: lower leaves very small, distant, lanceolate, the upper tufted, lanceolate at base, linear-subulate above, distantly serrate toward the apex; costa percurrent; areolation distinct: male and female flowers gemmiform, terminal: capsule subcylindrical, thin; lid narrowly conical; teeth attached to a very short basilar membrane, the segments of various length, articulate, papillose, purple. — *Trichostomum glaucescens,* Hedw. Musc. Frond. iii. 91, t. 37; Bryol. Eur. t. 184; Sulliv. Mosses of U. States, 26. *Sælania cæsia,* Lindb. Utk. Nat. Grupp. Bladm. 35; Braithw. Brit. Moss-Fl. i. 176, t. 26, F.

Hab. Lake Superior (*Agassiz*); Brattleboro, Vermont (*Frost*); Minnesota (*Lapham*); Rocky Mountains (*Drummond, Downie*), etc.

42. TRICHOSTOMUM, Smith.

Plants cespitose or pulvinate. Leaves gradually lengthening from the base of the stem upward; areolation minute, chlorophyllose in the upper part, diaphanous in the lower. Teeth of the peristome divided to the base into two equal semiterete very papillose segments, either entire or sometimes irregularly divided or connate. Flowers dicœcious.

1. **T. tophaceum,** Brid. Stems of various length: leaves open from an erect base, soft, linear-lanceolate, obtuse, carinate-concave, reflexed on the borders; costa stout, vanishing below the apex; perichætial leaves longer, more obtuse: capsule ovate-oblong, on a thick red often flexuous pedicel; lid obliquely rostrate, variable in length: teeth unequal, the segments either free or partly connate, pale red; annulus none. — Musc. Recent. Suppl. iv. 84; Bryol. Eur. t. 175. *Didymodon* (?) *diversifolius*, Aust. Musc. Appal. n. 115.

HAB. Very common on moist limestone rocks; California (*Bigelow, Bolander, Gibbons*); Dallas County, Texas (*Boll*); Owen Sound, Canada (*Mrs. Roy*); Niagara Falls (*Olney*), sterile.

2. **T. pyriforme.** Plants cespitose, very short, dark straw-color, the male plants much the smaller: stem-leaves lanceolate, blunt at the apex, the upper longer, undulate on the borders, all entire, concave, with the upper areolation close, opaque, obsoletely papillose on the back; costa stout, vanishing below or at the apex; perichætial leaves longer, oblong and half-clasping at base, lanceolate, distinctly undulate, obtuse: calyptra reaching to the base of the lid: capsule short, obovate, truncate, subpyriform; lid large at base, obliquely long-rostrate; teeth split nearly to the base into nearly equal filiform segments; annulus large, compound, easily detached.

HAB. Florida (*Garber*); communicated as n. 338.

Allied to *T. tophaceum* in the character of the peristome and the obtuse perichætial leaves, but different in the mode of growth, the size of the plants, the subpyriform shape of the annulate capsule, etc.

3. **T. crispulum,** Bruch. Plants densely cespitose, bright green, slender: comal leaves open, involute or twisted when dry, linear from a slightly enlarged base, cucullate, incurved at the apex and mucronate by the excurrent costa; borders erect, flexuous; areolation very small, indistinct in the upper part; perichætial leaves longer and mucronate: capsule elliptical, irregularly wrinkled when dry; lid long-rostrate from a narrow red orifice; teeth divided into irregular and unequal segments, connate or free, papillose; annulus none. — Regensb. Fl. xii. 395, t. 4; Bryol. Eur. t. 173.

HAB. On the ground, Guadalupe Island, Lower California (*Palmer*); common in Europe, rare in America.

4. **T. flavo-virens,** Bruch. Plants loosely cespitose, sparingly branching, 1 or 2 c.m. long, yellowish green above, pale or

ferruginous in the lower part: lower leaves small, distant, erect, the upper tufted, open, oblong and whitish at base, linear-lanceolate, undulate, concave or subcarinate above, mucronate by the thick excurrent costa, entire; perichætial leaves similar: capsule oblong, cylindrical, erect, yellowish, with a red orifice, slightly sulcate when dry, of thin texture; pedicel comparatively long, straight or flexuous, yellowish; lid conical-rostrate, slightly inclined; teeth long, slender, filiform, nearly equal, scarcely articulate, purple; basilar membrane narrow. — Regensb. Fl. xii. 404, t. 7; Bryol. Eur. t. 172.

Var. **crassinerve.** Plants shorter: leaves narrower; costa thick, vanishing below or at the apex: teeth of the peristome whitish. — *T. crassinerve*, Hampe, Linnæa, xxx. 456.

Hab. Florida, on the ground (*D. B. Smith, Garber, J. Donnell Smith*); the variety near San Rafael, and in the mountains of California (*Bigelow, Bauer, Bolander*).

5. **T. flexipes,** Bruch & Schimp. Stems short, 4 to 6 m.m. long, branching by innovations: leaves linear, acuminate, undulate on the borders, serrate upward; costa white, shining, percurrent: capsule narrowly oblong-ovate, chestnut-color, on a flexuous or curved pedicel; lid conical-rostrate; teeth straight, equal, regularly bifid; annulus large, revoluble. — Bryol. Eur. t. 171.

Hab. On the ground, California (*Bigelow, Bolander*); common.

6. **T. anomalum,** Schimp. Plants loosely cespitose, 1 to 4 c.m. long: leaves linear-lanceolate to the point, serrate above, more or less distinctly papillose on the inner surface: male flowers in separate or aggregated buds: capsule oblong, cylindrical or rarely slightly curved, erect on a long flexuous reddish pedicel; teeth long, equal, erect, strict, dark red; annulus large, easily detached. — Bryol. Eur. Coroll. 28. *Barbula anomala*, Bruch & Schimp. Bryol. Eur. t. 169.

Hab. California (*Coulter, B. W. James*); Florida (*Garber*).

43. DESMATODON, Brid. (Pl. 2.)

Plants sparingly branching, radiculose at base or tomentose their whole length. Leaves ovate or obovate, oblong, blunt, apiculate or gradually acuminate, costate; areolation close, opaque, papillose and chlorophyllose in the upper part, loose

and hyaline toward the base. Inflorescence monœcious or diœcious; male flowers terminal or axillary, the fertile gemmiform; perichætial leaves similar to the upper stem-leaves. Calyptra long, cucullate. Capsule erect, arcuate or cernuous and pendent, oval-oblong or subcylindrical, distinctly annulate. Peristome of 16 subulate bifid teeth; segments round-tetragonal, filiform, free or irregularly and transversely connate, granulose, erect when moist, incurved when dry, rarely slightly twisted to the left. Columella projecting beyond the mouth of the ripe capsule.

Allied in habit, mode of growth, and texture of the leaves to *Pottia;* in the character of the peristome to *Trichostomum* and *Barbula.*

* *Capsule erect.*

1. **D. latifolius,** Brid. Monœcious: stems 1 or 2 c.m. long: leaves open, erect, incurved or slightly twisted when dry, oval-oblong, acuminate or aristate by the excurrent costa, concave or carinate, with borders revolute: calyptra covering the capsule to its base: capsule oblong, cylindrical; lid short-beaked, oblique; annulus simple. — Bryol. Univ. i. 524; Bryol. Eur. t. 130. *Dicranum latifolium,* Hedw. Musc. Frond. i. 89, t. 33. *Trichostomum latifolium,* Schwaegr. Suppl. i. 145; Lindb. Trichost. 224.

Var. **glacialis,** Schimp. Stem longer, slender: costa vanishing below the apex. — Syn. 157.

Hab. California (*Bolander*); Rocky Mountains, with the var. (*Drummond, E. Hall, Downie*); Nevada Mountains (*Watson*); Cascade Mountains (*Lyall*); San Juan Range, Colorado (*Brandegee*).

2. **D. Systilius,** Bruch & Schimp. Monœcious: leaves large, ovate-oblong, soft, flat on the borders, minutely crenulate; costa excurrent into a long hair: capsule narrower, cylindrical, soft; lid attached to the columella and falling with it; teeth smaller, less regular, partly transversely coherent to each other, pale. — Bryol. Eur. t. 131. *Trichostomum Systilium,* Muell. Syn. i. 589.

Hab. Mount Dana, California (*Bolander*); Rocky Mountains (*Drummond*); Colorado (*Downie*).

3. **D. arenaceus,** Sulliv. & Lesq. Pseudo-diœcious: plants short, widely cespitose: lower leaves short, erect, ovate-

oblong, the upper longer and tufted, lingulate-oblong, obtuse and short-apiculate at the apex, crenulate on the margin, papillose and revolute in the upper part; costa thick, vanishing below or at the apex: male flowers terminal, sometimes in detached plants or buds scattered in the compact tufts: calyptra short, long-beaked: capsule long, narrow, cylindrical, erect or slightly curved, broadly annulate; lid conical-obtuse; teeth whitish, punctulate, distantly articulate, coherent nearly to the middle, free above and split into irregular segments. — Musc. Bor.-Amer. Exsicc. n. 93; Sulliv. Mosses of U. States, 28; Icon. Musc. 45, t. 29. *Desmatodon Ohioensis*, Schimp. Syn. 159.

Hab. Sandstone rocks, Central Ohio, etc.; common.

4. **D. Garberi.** With the aspect and mode of growth of *D. arenaceus*, it differs in the dicœcious inflorescence, the leaves narrower, oblong or lingulate, lanceolate or obtuse to the apiculate apex, with borders inflexed above and not crenulate on the margin, the costa percurrent, prolonged downward and decurrent below the base of the leaves, the cells of the areolation not half as large, opaque and scarcely papillose on the back, the capsule oblong-oval, broader in the middle, narrowed to the pedicel and upward to the conical longer-beaked lid, the teeth cut into two unequal segments free to the base, attached to a short membrane, the annulus simple.

Hab. Florida (*Garber*).

5. **D. Porteri,** James. Dicœcious: also closely related to *D. arenaceus*, but differing in the stems much shorter (1 to 3 m.m. long), tawny green, the leaves oblong, tapering to the acute apex, bordered in the upper part by a pellucid margin not reflexed, the areolation very small and opaque, the dicœcious inflorescence, the capsule shorter, oblong, straight, the teeth separated nearly to the base and split into nearly equal segments. — Aust. Musc. Appal. n. 123; Sulliv. Icon. Musc. Suppl. 36, t. 23.

Hab. On rocks at Easton, Pennsylvania (*T. C. Porter*); Niagara Falls (*G. W. Clinton*).

6. **D. plinthobius,** Sulliv. & Lesq. Dicœcious: plants short, in pale green tufts: lower leaves ovate-oblong, with a short hair-point, the upper lingulate-oblong, carinate-concave with the borders revolute all around; areolation minute, quadrate and very chlorophyllose, and papillose in the upper part;

costa stout, excurrent into a long whitish smooth flexuous hair: male flowers gemmaceous, terminal: capsule cylindrical-oblong, erect or slightly curved; lid short-rostrate, obtuse, inclined; peristome short, with fragile whitish granulose teeth, split to the middle; annulus very large. — Musc. Bor.-Am. Exsicc. n. 94; Sulliv. Mosses of U. States, 28, t. 2, and Icon. Musc. 47, t. 30.

Hab. Brick walls and pavements, Charleston, S. Carolina (*Ravenel*); Nashville, Tennessee (*Lesquereux*); limestone rocks, Pennsylvania (*Porter*); Texas (*Lindheimer*); Savannah, Georgia (*J. Donnell Smith*).

Related to *D. latifolius*, Bruch & Schimp., differing in the dicœcious inflorescence, the longer hair-point, the longer and narrower capsule, the longer rostrate operculum and short calyptra, the large compound annulus, and the short peristome with teeth divided only to the middle.

7. **D. Neo-Mexicanus**, Sulliv. & Lesq. Monœcious: densely cespitose, pale green: much like the last species, from which it differs in the inflorescence and in the shorter whitish teeth, which are scarcely split or nearly entire. — Musc. Bor.-Amer. Exsicc. n. 95.

Hab. Texas (*Wright*).

8. **D. nervosus**, Bruch & Schimp. Monœcious: plants short, 1 c.m. long, subcespitose or pulvinate; tufts dirty green: leaves crowded, twisted when dry, oblong or subspatulate, acuminate, concave, reflexed on the borders; areolation more or less papillose, dense in the upper part, loose and rectangular in the lower; costa vanishing below the apex or passing up into a short point: male flowers gemmiform, at the base of the fertile innovations: calyptra covering the capsule to near the base: capsule elliptical; lid short, obliquely beaked; teeth attached to a somewhat large membrane, very variable, short, the segments unequal, often cohering, very papillose, ferruginous, erect, open when dry, oblique when moist; annulus simple. — Bryol. Eur. t. 132. *Trichostomum convolutum*, Brid.; Muell. Syn. i. 590. *Grimmia atrovirens*, Smith, Engl. Bot. t. 2015. *Barbula atrovirens*, Schimp. Syn. (ed. 2) 194. *Tortula atrovirens*, Lindb.

Var. **edentulus**, Bruch & Schimp. Plants smaller: lid erect, conical: peristome rudimentary. — Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. (ed. 2), n. 121.

Hab. On clay and adobe walls, California (*Bolander*), very common; Guadalupe Island, Lower California (*Palmer*).

9. **D. obtusifolius,** Schimp. Monœcious: plants 1 c.m. long, subcespitose: leaves crowded, soft, erect, spreading from the middle, lingulate-lanceolate, acuminate or obtuse, very entire, hyaline up to three-fourths of their length, densely chlorophyllose above, minutely papillose on the back, the lower smaller, obtuse or blunt-pointed, yellowish hyaline nearly the whole length: male flowers gemmaceous: calyptra tawny: lid short-beaked; teeth free, slightly twisted to the left; annulus large, compound, revoluble. — Syn. 158. *Tortula obtusifolia*, Schleich.; Lindb. Trichost. 236. *Barbula obtusifolia*, Schwaegr. Suppl. i. 129, t. 31. *Desmatodon flavicans*, Bruch & Schimp. Bryol. Eur. t. 133.

HAB. Rocky Mountains (*Drummond*); on the ground, California (*Bolander*); Echo Cañon, Wasatch Mountains (*Watson*); Janesville, Wisconsin (*Lapham*).

Very variable in the size of the plants and of the leaves, which are also more or less obtuse or even distinctly acuminate.

10. **D. Guepini,** Bruch & Schimp. Inflorescence and mode of growth as in the preceding: lower leaves ovate-lanceolate, the upper oval-oblong, awned by the excurrent costa, with the borders recurved, distinctly papillose on the back: capsule oblong, subcylindrical; lid large, conical, short-beaked; teeth free to the base, very papillose, reddish, erect when dry, half-convolute when moist; annulus narrow, simple. — Bryol. Eur. t. 133. *Barbula Guepini*, Schimp. Syn. (ed. 2), 197. *Trichostomum Guepini*, Muell. Syn. i. 590.

HAB. With the last, California (*Bolander*).

* * *Capsule curved or pendent.*

11. **D. cernuus,** Bruch & Schimp. Plants short, loosely cespitose: leaves closely imbricate, the lower small-ovate, the upper spatulate-lanceolate, obscurely serrate or crenulate above, papillose, mucronate by the excurrent costa: capsule cernuous, broadly ovate, solid, brown, on a long reddish pedicel; lid short-rostellate; teeth cut into two or three filiform segments, either free or partly coherent; annulus compound, persistent. — Bryol. Eur. t. 134. *Didymodon latifolius*, Wahl. Fl. Lap. 313, t. 20. *Trichostomum cernuum*, Lindb. Trichost. 225.

HAB. Rocky Mountains of British America, in fissures of wet rocks (*Drummond*); Ruby Valley, Nevada (*Watson*); Edmonton River, Canada, etc. (*Macoun*). The species has not been found, however, in Colorado nor in California.

12. **D. obliquus,** Bruch & Schimp. Stems short: leaves ovate-oblong or ovate-lanceolate, awned or cuspidate by the excurrent costa, revoluble on the borders, closely papillose and chlorophyllose in the upper part, the double papillæ distinctly prominent on the borders: capsule cylindrical, oblique: teeth reddish and bifid to near the base, twisting to the left; annulus simple. — Bryol. Eur. t. 136. *Tortula suberecta*, Hook. & Wils. in Drumm. Musc. Amer. n. 145. *Trichostomum obliquum*, Muell. Syn. i. 594.

HAB. Shady alpine localities; Rocky Mountains (*Drummond*).

13. **D. Laureri,** Bruch & Schimp. Plants soft, in small compact green tufts intermixed with radicles, yellowish below: leaves close, imbricate, spreading, soft, ovate-oblong, the upper longer, apiculate, bordered by a narrow yellowish loosely areolate revolute margin, reddish at base, hyaline upward to the middle, papillose on both faces: capsule pendent from the arcuate pedicel, oblong; lid small, with a short blunt beak; teeth purple, slightly twisted, attached to a broad dark red membrane; annulus double, each series detaching separately. — Bryol. Eur. t. 135. *Trichostomum Laureri*, Schultz, Regensb. Flora, x. 161. *Tortula Laureri*, Lindb. Trichost. 243.

HAB. Snow Range of the Rocky Mountains, upon the ground (*Drummond*); Colorado (*Downie, Rothrock, Wolf*).

44. BARBULA, Hedwig. (Pl. 1.)

Mode of growth, habit, and form and reticulation of the leave. as in *Trichostomum*. Peristome of 16 teeth, divided into 32 long filiform segments, twisted to the left, attached to a more or less elongated tubuliform tessellate membrane.

§ 1. ALOIDELLÆ. — *Plants very small, gregarious, annual: leaves rigid, incurved above; costa thickened and dilated toward the apex, and covered with articulate filaments: basilar membrane of the peristome short.*

1. **B. brevirostris,** Bruch & Schimp. Bisexual: plants very small, gemmiform: lower leaves round-ovate, the upper broadly oblong, obtuse: teeth making a single turn; annulus broad, revoluble. — Bryol. Eur. t. 138. *Tortula brevirostris*, Hook. & Grev.; Lindb. Trichost. 233.

HAB. Rocky Mountains (*Drummond*); British Columbia (*Macoun*).

2. **B. rigida,** Schultz. Dicœcious: leaves spreading from an erect base, oblong, obtuse or apiculate, rarely hair-pointed: calyptra long-rostrate, reaching the middle of the capsule: capsule elliptical-oblong; lid long-beaked; teeth long, twice twisted; annulus broad, revoluble. — Recens. Barb. 196, t. 32; Bryol. Eur. t. 137. *Tortula stellata*, Lindb. Trichost. 233.

Vars. **mucronulata,** and **pilifera,** Schimp. Upper leaves mucronate, or hair-pointed. — Syn. 164.

Hab. Rocky Mountains, Colorado (*E. Hall*). Var. *mucronulata* on Guadalupe Island, Lower California (*Palmer*).

3. **B. ambigua,** Bruch & Schimp. Dicœcious: plants somewhat longer: leaves expanded star-like from an ovate base, linear-lanceolate, blunt at the apex, reddish on the back: calyptra shorter, scarcely reaching the base of the short-beaked lid: capsule cylindrical-oblong, furrowed when dry; teeth longer, twisted once or a little more, incurved when dry. — Bryol. Eur. t. 139. *B. rigida*, Hedw. Musc. Frond. i. 65, t. 25, excl. peristome. *Tortula ambigua*, Angstr.; Lindb. Trichost. 235.

Hab. On the ground, near Athens, Illinois (*E. Hall*).

§ 2. Chloronotæ. — *Plants perennial, cespitose: leaves broad and thin, not incurved on the borders; costa round, filamentose above: teeth of the peristome closely twisted; basilar membrane short, tubulose.*

4. **B. membranifolia,** Schultz. Monœcious: the plants longer, in thick small tufts, hirsute with white hairs upon the leaves, interwoven with radicles: leaves open-erect, broadly ovate and oblong, lanceolate, very concave, the areolation irregularly rhomboidal at the denticulate apex; costa excurrent into a long white hair: male flowers near the base of the perichætium, monophyllous or diphyllous: calyptra reaching to the middle of the ovate-elliptical erect or slightly curved capsule; lid narrow, short-beaked; teeth thrice twisted; annulus simple. — Recens. Barb. 226, t. 34; Bryol. Eur. t. 140. *Tortula membranifolia*, Hook. Musc. Exot. t. 26. *Tortula squamigera*, DeNot.; Lindb. Trichost. 235.

Hab. Western Arizona, near the mouth of Santa Maria Creek (*Bigelow*); Rocky Mountains (*E. Hall*).

5. **B. chloronotos,** Bruch. Dicœcious: plants short, closely cespitose: leaves close, imbricate when dry, spreading

when moist, ovate-oblong, obtuse or slightly acute, concave, with a round yellowish costa excurrent into a smooth more or less enlarged hair; meshes of the areolation minutely quadrate to near the base, there becoming loose and rectangular: male plants smaller: capsule elliptic-oval, narrow, slightly curved, smaller; teeth reddish, twice twisted; annulus compound. — Muell. Musc. Sard. 1829; Bryol. Eur. t. 141. *Tortula crassinervis*, DeNot.; Lindb. Trichost. 236.

HAB. Dry ravines on Williams Fork of the Colorado, with *B. membranifolia* (*Bigelow*).

§ 3. CUNEIFOLIÆ. *Plants short: leaves soft, more or less papillose, ovate or spatulate-oblong, with a round naked costa: teeth of the peristome long, closely many times twisted.*

6. **B. cuneifolia,** Brid. Monœcious: plants ½ to 1 c.m. long, soft, simple, subcespitose: lower leaves distant, broadly ovate, short-acuminate, the upper crowded and rosulate, oblong-obovate or spatulate, abruptly acuminate or apiculate; costa vanishing below the apex, sometimes prolonged into a mucro, rarely into a short hair-point; areolation loose: male flowers 1–3-leaved: calyptra large, descending to below the middle of the capsule: pedicel reddish: capsule elliptic-oblong, scarcely incurved; teeth attached to a somewhat long tubular membrane; annulus simple, falling off in fragments. — Bryol. Univ. i. 549; Bryol. Eur. t. 156. *Bryum cuneifolium*, Dicks. Plant. Crypt. iii. 7. *Tortula cuneifolia*, Roth; Lindb. Trichost. 237.

HAB. Clay soil, near Oakland, California (*Bolander*).

7. **B. Vahliana,** Schultz. Monœcious: plants ½ to 1 c.m. long, gregarious or subcespitose: leaves soft, the lower oblong, the upper oblong or lingulate, undulate on the borders, margined by a row of yellowish cells, distinctly crenulate, flat or reflexed, mucronate or subulate by the excurrent costa: male flowers terminal on short slender branches: capsule long, cylindrical, narrow, slightly curved; lid short-subulate; teeth long, attached to a quadrately tessellate basilar membrane, closely convolute; annulus broad, compound. — Recens. Barb. 222, t. 34; Bryol. Eur. t. 157. *Tortula Vahliana*, Wils.; Lindb. Trichost. 237.

HAB. Clay soil; Cajon Pass (*Bigelow*), and Monte Diablo (*Bolander*).

8. **B. marginata,** Bruch & Schimp. Monœcious: habit and mode of growth as in *B. Bolanderi;* leaves soft, oblong, lingulate or subspatulate, obtuse or slightly acuminate, mucronate or cuspidate, carinate-concave, bordered by a double layer of two or three rows of rectangular thick yellowish cells; costa yellow, passing beyond the apex; areolation minutely quadrate-hexagonal, chlorophyllose and papillose in the upper part, loose and smooth in the lower: male flowers axillary: capsule oblong-cylindrical, light brown; lid narrowly conical, blunt, slightly curved; teeth twisted once; annulus broad, simple. — Bryol. Eur. t. 158. *Tortula cæspitosa,* Hook. & Grev. *T. marginata,* Spruce; Lindb. Trichost. 238.

Hab. California (*Bigelow*); walls of houses in Virginia and Washington (*James*).

9. **B. Bolanderi,** Lesq. Diœcious: plants 5 m.m. long, gregarious, dirty straw-color, simple or fasciculately branched at the apex: lower leaves short, open, the upper rosulate, spreading or reflexed, lingulate or oblong, obtuse, apiculate by the thick brown excurrent costa; borders flat, or reflexed in the middle of the leaves: male plants slender, intermixed with the fertile ones: capsule narrowly ovate, erect or inclined, dark red; lid conical-rostrate, blunt, straight or inclined; teeth granulose, on a short basilar yellowish membrane, twisting once; annulus narrow, simple, persistent. — Trans. Am. Phil. Soc. xiii. 5; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. (ed. 2), n. 139.

Hab. Rocks near the Bay of San Francisco, California (*Bolander*), abundant.

Related to *B. Vahliana* and *B. marginata,* but differing from the first in its shorter rosulate simple stems, from the second in the emarginate leaves and simple annulus, from both in the broader lingulate merely mucronate leaves, the dark red capsule, the short basilar membrane of the peristome, and the diœcious inflorescence.

10. **B. amplexa,** Lesq. l. c. Diœcious: plants gregarious, very short, dirty green: leaves hard but fragile, loosely imbricate, lingulate, obtuse or short-acuminate, concave, with borders revolute in the middle or plane all around; costa thick, vanishing below the apex; upper areolation chlorophyllose, opaque; inner perichætial leaves two, closely clasping the vaginule, erect, abruptly recurved at the apex, sometimes truncate, apiculate: capsule short, narrow, pale green when young, yellowish when

old, cylindrical, erect; pedicel long, slender, yellow; lid straight, reddish: the inflorescence, peristome, and annulus as in the last species. — Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. (ed. 2) n. 140.

HAB. On stones, in springs near San Francisco, California (*Bolander*); Fort Colville (*Watson*).

11. **B. brevipes,** Lesq. Dicœcious: gregarious or subcespitose; stems very short, simple: leaves rosulate, lingulate or oblong, cuneiform, obtuse, revolute on the borders, carinate, concave in the upper part; costa excurrent into a short hair-like smooth point: male plants slender; flowers terminal: capsule long, cylindrical, slender, subincurved; lid long-conical, obtuse; peristome syntrichial; basilar membrane long, quadrately tessellate; teeth long, closely twisted, blood-red; annulus large, compound. — Mem. Calif. Acad. i. 12.

HAB. Mud walls, Mission Dolores, in mats an inch in diameter or more, and on the Russian River divide, California (*Bolander*); Western Nevada (*Watson*).

Related in the mode of growth and characters of the leaves to the three preceding species, but differing in the long tubular membrane of the peristome, which is like that of *B. canescens*, a stouter species which has the areolation of the leaves smaller and close, and a monœcious inflorescence.

12. **B. muralis,** Timm. Monœcious: pulvinate or cespitose tufts whitish green; stems ½ to 2 c.m. long: lower leaves oblong-lanceolate, the upper long-lingulate, unequal sided at the very papillose apex, closely revolute, thus appearing marginate; costa broad, passing beyond the apex into a more or less elongated hair-point; areolation small, indistinct in the upper part, loosely rectangular and hyaline in the lower: male flowers gemmiform in separate branchlets: capsule ovate-oblong or subcylindrical, regular, brown; lid long-beaked, slightly curved; teeth attached to a very narrow membrane, closely twisted; annulus compound. — Fl. Megap. 220; Bryol. Eur. t. 159. *Bryum murale*, Linn. Spec. Pl. 1117. *Tortula muralis*, Hedw. Fund. Musc. ii. 92; Lindb. Trichost. 239.

HAB. On rocks, Pennsylvania (*T. C. Porter*); California (*Bolander*); Charleston, S. C. (*J. Donnell Smith*); Norfolk, Virginia (*James*); on stone walls, Lodi, New Jersey (*Austin*).

Very variable in the size of the plants and of the capsule, and in the shape of the leaves, which are lanceolate or obtuse or even obcordate at the apex, with the hair-like point varying in length.

§ 4. UNGUICULATÆ. *Plants longer, cespitose: leaves linear-lanceolate; areolation close, minute, chlorophyllose above, hyaline or yellowish at base; costa naked, not prolonged into a hair-point; perichætium sheathing: flowers dioecious: teeth of the peristome long, closely twisted, attached to a very short membrane.*

13. **B. unguiculata,** Hedw. In soft bright or dirty green tufts: leaves narrowly ovate and oblong, linear-lanceolate, generally blunt at the apex or mucronate by the excurrent costa, plane, concave and revolute on the borders from the middle downward, carinate and flat on the borders in the upper part, where the green areolation is closely papillose and indistinct; perichætial leaves hyaline to near the apex: calyptra narrow, long-beaked, reaching a little below the conical long-rostrate straight or curved lid: capsule oblong-elliptical or subcylindrical, regular or subincurved; teeth purple, twisted two or three times; annulus none. — Frond. Musc. ii. 92, and Musc. Frond. i. 59, t. 23; Bryol. Eur. t. 142, 143. *Bryum unguiculatum,* Dill. *Tortula unguiculata,* Roth; Lindb. Trichost. 241.

HAB. On damp black soil, along fences, on rocks, stones, etc.; very common and variable.

A number of forms are described by authors, as Vars. *cuspidata, apiculata, microcarpa, obtusifolia, fastigiata,* etc., whose characters are indicated by their names. Most of these, if not all, are found in N. America; the last only is alpine.

14. **B. Jooriana,** Muell. Loosely cespitose, small, bright green, easily moistened and soft; stems simple or with a short terminal innovation: leaves slightly crispate, erect, open when moistened, linear-lanceolate from a half-clasping narrowly oblong more pellucid base, obtuse, acute or short-mucronate, slightly revolute toward the base; costa yellow, scabrous on the back, excurrent; cells of the areolation rectangular and large toward the base, minutely hexagonal, very chlorophyllose, distinct and scarcely papillose toward the apex; perichætial leaves erect, long-sheathing, oblong, acuminate, not mucronate: capsule erect, small, oblong, on a short reddish pedicel; teeth very slender, hair-like, split to near the base, reddish. — Bull. Torr. Club. v. 49, and Regensb. Flora, lviii. 77.

HAB. Clayey ground, near Baton Rouge (*Dr. Joor*). Specimens doubtfully referred to this species by Austin are ticketed as from Port Royal, S. C. (*Austin*).

The author remarks that it is somewhat like *B. unguiculata.* Indeed, from the characters above given, the difference is unimportant. *B. Ravenelii*, Aust. (Coult. Bot. Gaz. ii. 89), described from sterile specimens, appears referable to this species. The short stems, the leaves crispate when dry, ovate and lanceolate-oblong and subcarinate, somewhat obtuse, minutely apiculate, with borders narrowly recurved at base, the costa minutely papillose on the back, etc., are characters that are indicated in *B. Jooriana.*

15. **B. fallax**, Hedw. Plants loosely and widely cespitose, dusky green, reddish brown when dry; stems radiculose at the base of the innovations: leaves squarrose or recurved-spreading, twisted when dry, lanceolate or linear-lanceolate from a more enlarged base, connate, revoluble on the borders; cells of the areolation minute, shortly papillose, yellowish, diaphanous, equal to the base; perichætial leaves half-sheathing, the inner bright green, the outer brownish green or ferruginous: calyptra descending lower than in *B. unguiculata:* capsule ovate-oblong, gradually narrowed to the orifice, slightly incurved, brown; lid purple, subulate, nearly as long as the capsule; teeth very long and many times closely twisted; annulus none. — Musc. Frond. i. 62, t. 24; Bryol. Eur. t. 147. *Tortula imberbis*, Smith; Lindb. Trichost. 250.

Hab. Rocky Mountains (*Drummond*); Fort Edward, New York, and Monroe Co., Pennsylvania (*James*); College Hill, Easton (*T. C. Porter*); Ontario, Canada (*Mrs. Roy*).

Of the numerous varieties, the more marked are Var. *brevicaulis*, Bruch & Schimp., with simple and shorter stem, and shorter capsule, lid, and peristome; and Var. *brevifolia*, Schultz, densely cespitose, with ovate-lanceolate leaves.

16. **B. subfallax**, Muell. Much resembling the last, but differing in its pale green color, the leaves not plicate at base, the cells of the areolation minutely papillose, round-quadrate, soft, more distinctly rectangular and pellucid at the base, the perichætial leaves longer and larger, spreading, revolute on the borders like the stem-leaves, slightly sheathing at base, the cells of the areolation longer and narrower, the capsule on a short purple flexuous pedicel, and the annulus simple, persistent. — Bot. Zeit. xx. 338. *B. fallax*, Sulliv. Pacif. R. Rep. iv. 186.

Hab. Cajon Pass, Sierra Nevada (*Bigelow*); near San Francisco (*Bolander*); San Jose Valley (*Bauer*).

Except the presence of a simple scarcely distinct annulus, the specific characters are unimportant.

17. **B. recurvifolia,** Schimp. Tufts reddish brown; stems slender: leaves spreading or curved backward, loosely imbricate and slightly twisted when dry, broader, shorter and more solid than those of *B. fallax*, acutely carinate, papillose on both faces; borders plane, erect above, reflexed near the base; costa brown to the apex; areolation as in *B. fallax*, the basilar cells only a little larger, quadrate and rectangular: calyptra very narrow, long-subulate, covering a third of the capsule: capsule erect, long, cylindrical, regular, reddish brown; lid subulate, beaked; annulus none. — Coroll. 141, and Syn. 170; Aust. Musc. Appal. Suppl. *B. fallax*, var. *recurvifolia*, Wils. Bryol. Brit. 124. *Tortula recurvifolia*, Berk.; Lindb. Trichost. 250.

Hab. On rocks, Hoboken, New Jersey: Niagara Falls (*Austin*); region of the great lakes, Canada (*Macoun*); Colorado (*H. A. Vane*).

18. **B. Cruegeri,** Sonder. Plants very loosely and widely cespitose, reddish brown below, pale green above; stems slender, divided by a simple innovation at the apex: stem-leaves distant, somewhat twisted, open, recurved when moist, and incurved at the apex, oblong-lanceolate, obtuse, short-mucronate, the borders entire, revolute at base; nerve thick, subexcurrent, green; cells of the areolation minutely quadrate and green at base, very minute and very opaque, papillose in the upper part; perichætial leaves larger, broader and more loosely areolate at base: capsule erect, narrowly cylindrical, pale; lid obliquely rostrate, acute, red; teeth long and very slender, closely twisted; annulus none. — Muell. Syn. i. 618.

Hab. Borders of the Mississippi River, Louisiana (*C. Mohr*); Florida (*Garber*); sterile.

19. **B. cancellata,** Muell. Plants loosely cespitose, short, slender, simple, crispate, yellowish green: stem-leaves erect, close, linear-lanceolate, obtuse and short-mucronate, concave, deeply canaliculate with a thick reddish costa, rugose on the back, narrowly reflexed toward the base; cells of the areolation small, regularly rectangular at base, smaller, quadrate, dark green and papillose above; perichætial leaves narrowed and lanceolate-acuminate from the sheathing base, with a looser more elliptical areolation: pedicel red, flexuous: lid conical, oblique, as long as the cylindrical capsule; teeth cancellate (fontinaloid), very slender and smooth, purple, split to near the base. — Regensb. Flora, lvi. 483 (1873).

HAB. Texas, Dallas County (*J. Boll*).

Much like the last, but differing in the long teeth of the conical thin peristome, appendiculate like those of a *Fontinalis*.

20. **B. brachyphylla,** Sulliv. Plants long, densely cespitose, fastigiately-branching, radiculose their whole length: leaves open, ovate, narrowed to the obtuse apex, thick, dark brown, the borders recurved all around; costa stout, percurrent: calyptra short: capsule cylindrical, erect; lid long-rostrate; teeth twisted half-way around or scarcely so much, attached to a very narrow membrane. — Pacif. R. Rep. iv. 186, t. 2; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. n. 100[e].

HAB. Near Benicia, California (*Bigelow*).

21. **B. purpurea,** Muell. Differs from the preceding species in its small rigid purple tufts, the short stems divided above into a few short branches, naked below: stem-leaves few, open, spreading when moist, purplish, oblong and broader in the lower part, then obliquely lanceolate, blunt at the apex, the costa thick, purple, canaliculate, the cells of the areolation thick, small, reddish, quadrate, in the upper part rounded, smaller and more oblique: capsule small, ovate, with a broad orifice when deoperculate, the calyptra long, embracing its base. — Regensb. Flora, lviii. 78 (1875). *B. brachyphylla*, Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. (ed. 2), n. 135, in part, fide Muell.

HAB. On rocks near Oakland, California, mixed with *B. virescens* (*Bolander*).

22. **B. rigidula,** Schimp. Tufts brown or dirty green; stem straight: leaves open or a little recurved, long-lanceolate, carinate, with borders recurved in the upper part, revolute in the lower, nearly smooth and very entire; basilar areolation rectangular, narrow, the upper minutely quadrate, distinct; costa percurrent; perichætial leaves scarcely distinct from the upper stem-leaves: calyptra long-beaked, often half-contorted: capsule erect or slightly curved, nearly cylindrical, chestnut-color, polished; pedicel straight, reddish; lid short-beaked, oblique; teeth attached to a short membrane with nodose segments, free or partly coherent, oblique or slightly twisted; annulus simple, narrow. — Syn. (ed. 2), 206. *Trichostomum rigidulum*, Smith, Fl. Brit. iii. 1238; Bryol. Eur. t. 176. *Tortula rigidula*, Lindb. Trichost. 249.

HAB. Rocky Mountains (*Drummond*); Russian River, California (*Bolander*); Vancouver Island (*Lyall*).

23. **B. vinealis,** Braun. Allied to *B. fallax:* plants more robust, shorter, in small reddish ferruginous tufts: leaves spreading or subrecurved, erect-incurved, imbricate when dry, the upper flexuous at the acute apex, more narrowly lanceolate from the ovate base; costa brown, subexcurrent; cells of the basilar areolation broader, rectangular, chlorophyllose, the upper minute, round, inflated or very slightly papillose; perichætial leaves longer, half-sheathing, more abruptly narrowed, subulate: calyptra reaching the middle of the capsule, subulate-beaked: capsule narrowly elliptical-oblong, regular or slightly incurved, reddish-brown, on a strong purplish pedicel; lid narrowly conical, obliquely rostrate; teeth shorter, paler, twisted once or once and a half around; basilar membrane short, punctulate; annulus double, broader. — Brid. Bryol. Univ. i. 830; Bryol. Eur. t. 148; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. (ed. 2), n. 130. *Tortula vinealis,* Spruce; Lindb. Trichost. 249, and Bot. Notis. 1865, 77.

Hab. Moist or shaded rocks, California (*Bigelow, Bolander, Watson*); very common in California and extremely variable.

24. **B. flexifolia,** Hampe. Differs from *B. vinealis* in the leaves crisped when dry, reflexed when moistened, the borders revolute, the capsule narrower subcylindrical, dark red or brown, and the teeth much twisted. — Linnæa, xxx. 456.

Hab. On the ground in the Sierra Nevada, California, at 3,500 feet altitude (*Bauer*); common in California (*Bolander*).

From the examination of a large number of specimens we find, contrary to Hampe's description, the operculum sometimes as long as or even longer than in *B. vinealis.* The author says that it is only one-third of the length of the capsule, and that the teeth of the peristome are reddish, then white or very variable in color, and he compares it to *B. semitorta,* Sulliv., from which it is very distant. This and other species of the *B. vinealis* group are most difficult to separate, and their number may be either reduced or indefinitely increased.

25. **B. virescens,** Lesq. Differs from *B. vinealis* in its longer stems, dark brown in the lower part, pale green above, the leaves longer-lanceolate from the base, undulate, with borders revolute to the apex, the areolation twice as large and composed of oval or round distinct cells, the perichætial leaves open, the lid shorter, the peristome less closely twisted, and the annulus broader. — Trans. Am. Phil. Soc. xiii. 4.

Hab. On rocks among redwoods near Oakland, California (*Bolander*). This species is intermediate between *B. flexifolia,* Hampe, and *B. semi-*

torta, Sulliv. It differs from the last in the revolute borders of the longer leaves, the peristome longer twisted, and attached to a broader basilar membrane.

26. **B. cylindrica**, Schimp. Much like *B. vinealis*, differing in the more slender flexuous stems, the lower leaves distant, long-lanceolate, the upper close, lanceolate at base, narrowly lanceolate and subulate above, recurved when moist, somewhat twisted when dry, deeply concave, verruculose, the borders recurved toward the base, the costa narrower, the perichætial leaves similar, the capsule slightly longer, cylindrical or subelliptical, the peristome twisted, and the annulus composed of a triple row of cells. — Syn. (ed. 2), 208. *B. vinealis*, var. *flaccida*, Bruch & Schimp. Bryol. Eur. *Tortula insulana*, DeNot. (?). *Tortula cylindrica*, Lindb. Bot. Notis. 1865, 76. *B. Beecheyi*, Lesq.; Watson, Bot. Calif. ii. 372.

Hab. Same as the last, and often mixed with it.

As Schimper remarks, it is difficult to separate this species from the loose forms of the preceding. The capsule is longer and has a longer pedicel. This and the following, considered as varieties of *B. vinealis*, were mixed and distributed in Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. (ed. 2), n. 131, as *B. vinealis*, var. *flaccida*. We have more recently received for comparison an original specimen of *Tortula insulana*, De Not., which apparently differs in its shorter more ovate cylindrical capsule, and the borders of the leaves reflexed from below the middle only. It seems, therefore, to be a distinct species, but the specimen is incomplete, the capsule being old and empty.

27. **B. elata**, Dur. & Mont. Plants dirty yellowish green, stronger, dividing by two innovations from below the flowering apex: leaves appressed, slightly crispate at the apex, open, erect when moist, loosely imbricate, the lower smaller, narrowly lanceolate, acute from the decurrent ovate enlarged base; borders entire, revolute from above the base to near the apex, where they are flat or slightly recurved; upper leaves much longer, linear-lanceolate from the ovate base, acute or blunt at the apex; cells of the areolation larger, quadrate, pellucid at base, very small, opaque, minutely papillose above; perichætial leaves lanceolate-subulate from the enlarged base, with a loose pellucid areolation: capsule elliptical-oblong, large, dark purple, like its pedicel; lid long, of the same color; annulus pale, compound. — Fl. Alger.; Muell. Syn. i. 620.

Hab. Near San Francisco (*Bolander*), mixed with the two preceding species.

The more distant leaves, less open, recurved when moist, the stem-leaves ovate, decurrent at base, and especially the larger broader capsule with longer twice-twisted teeth, etc., separate this species from *B. vinealis*. The above description, made from the examination of a large number of specimens, slightly differs from that of Mueller. But this author has compared specimens and confirmed their identity with the foreign plant.

28. **B. rubiginosa**, Mitt. Closely related to the preceding in the form and areolation of the leaves, and to *B. vinealis* in the size and mode of growth, but differing from both in the leaves merely appressed and curved when dry, in the much shorter lid, whose length is half that of the capsule, in the absence of a peristome, and in the annulus composed of a triple row of cells. — Journ. Linn. Soc. viii. 27, t. 5. *Pottia rubiginosa*, Watson, Bot. Calif. ii. 362.

HAB. Northwest America (*Douglas*).

29. **B. semitorta**, Sulliv. Plants short, simple, loosely cespitose: upper leaves longer, tufted, erect, half-clasping at base, horizontal, linear-lanceolate, with flat borders and a thick percurrent costa: calyptra long and narrow, twisted; lid enlarged at base, subulate, blunt at the apex, slightly inclined: capsule erect, regular, cylindrical-oblong; teeth long, half-twisted; annulus simple, narrow, persistent. — Pacif. R. Rep. iv. 186, t. 3.

HAB. Near Benicia, California (*Bigelow*).

Comparable to *B. brachyphylla*, Sulliv., with which it is mixed, differing in the shorter calyptra descending only to the base of the longer lid, the peristome less twisted, the leaves tufted at the top of the stems, squarrose-spreading, gradually tapering from near the base and not abruptly narrowed to the apex.

30. **B. artocarpa**, Lesq. Densely cespitose; stems slender, short, generally simple: lower leaves short-ovate at base, lanceolate above, shortly cuspidate by the stout excurrent costa, the upper longer and longer lanceolate-subulate; cells of the areolation small, round-quadrate above, rectangular and slightly broader at base; perichætial leaves large, clasping at base, contracted above, subulate, erect: capsule ovate-cylindrical, short, slender, contracted at the orifice; lid with a long-subulate more or less curved beak; teeth slender, whitish, once twisted; annulus simple, persistent. — Trans. Am. Phil. Soc. xiii. 4; Sulliv. & Lesq. Musc. Am.-Bor. Exsicc. (ed. 2), n. 133.

HAB. On the ground, Monte Diablo, California (*Bolander*); Monterey (*Watson*). Resembling the following species in aspect, the characters of the leaves, and form of the capsule, which, however, is annulate.

31. **B. gracilis,** Schwaegr. Densely tufted; plants short, olive or dusky green, simple or with few innovations: leaves open, erect, strict, loosely imbricate when dry, smooth, ovate-lanceolate, acuminate by the excurrent brown stout costa; borders revolute from the base to the middle; areolation round, minute but distinct, rectangular at the base; perichætial leaves large, reflexed on the borders, with a long flexuous point: capsule small, ovate-oblong, solid, more or less incurved; lid narrowly rostrate; teeth short, reddish, twisted; annulus none. — Suppl. i. 125, t. 34; Bryol. Eur. t. 145. *Tortula gracilis,* Schleich.; Lindb. Trichost. 249.

HAB. Crevices of limestone rocks, Brattleboro, Vermont (*Frost*).

Distinguished from *B. fallax* especially by the suberect straight leaves, the long-cuspidate perichætial leaves, the shorter small capsule, etc.

§ 5. CONVOLUTÆ. *Plants densely cespitose: leaves bright or yellowish green, chlorophyllose, twisted when dry; basilar areolation loose; perichætial leaves long-sheathing or convolute: capsule small, elliptical-ovate, subincurved, brown; teeth of the funnel-like purple peristome very long, twisted.*

32. **B. convoluta,** Hedw. Plants short, in dense tufts, bright green above: leaves open when moist, twisted when dry, narrowly lingulate-lanceolate, with flat borders, acute or apiculate by the excurrent costa; basilar cells quadrangular, the upper close, round, subopaque, minutely papillose; perichætial leaves convolute, the upper closely sheathing, obtuse or short-apiculate: capsule oblong-cylindrical, incurved, reddish brown, on a long yellow pedicel; annulus large, compound, revoluble. — Musc. Frond. i. 86, t. 32; Bryol. Eur. t. 154. *Tortula convoluta,* Schrad.; Lindb. Trichost. 248.

HAB. On the ground; British America (*Drummond*); Raccoon Mountains, Alabama (*Lesquereux*); Enon Valley, Pennsylvania (*James*); Oakland (*Bigelow*), and on burned trunks, Ukiah, California (*Bolander*).

33. **B. Closteri,** Aust. Known only from sterile plants, and closely related to the last, characterized, according to the author, by its sublinear or oblong-lanceolate subcarinate remarkably granulose leaves, very slightly recurved on one of the margins below the middle, with a minute hyaline point; leaves often strongly recurved at the apex. — Coult. Bot. Gaz. i. 29, and iv. 30.

HAB. New Jersey (*Austin*); Gainesville, Florida (*Ravenel*). In Rau & Hervey's catalogue united with *B. Cruegeri,* a very different species.

34. **B. agraria,** Hedw. Monœcious: plants short and simple, closely tufted, with few leaves: leaves close, erect, spatulate-lanceolate, involute on the borders; costa yellow, excurrent; cells of the basilar areolation large, the upper smaller, hexagonal, not opaque; inner perichætial leaves two, convolute, rounded to a blunt apex, loosely radiculose: male flowers on a short basilar branch, with leaves convolute, acuminate, erect: calyptra long-beaked, reaching to the middle of the capsule: capsule annulate, oblong-ovate or subcylindrical and slightly incurved, dark red, on a comparatively long reddish pedicel; lid long, narrowly conical; peristome twisted to the left. — Musc. Frond. iii. 17, t. 6; Muell. Syn. i. 604. *Bryum agrarium,* Swartz, Prod. 139.

Hab. On stones and stone walls; Key West, Florida (*Pourtales, Garber, J. Donnell Smith*); Apalachicola (*Drummond*).

This species, generally found in the West Indies, is referable to a separate section, *Hyophiladelphus,* Muell., related to the *Convolutæ,* especially by the involute stem-leaves and the convolute perichætial ones. Its monœcious inflorescence and the flat teeth twisted to the left are characters at variance with those of that section.

35. **B. Raui,** Aust. Plants very short, gregarious, subcespitose: leaves tufted, crispate, spatulate-ovate, cymbiform, concave, acuminate or apiculate, smooth, flat on the borders; costa stout, subexcurrent; basilar areolation loose, the upper obscure, of nearly round unequal cells; perichætial leaves thinner, convolute, often blunt, thinly costate: flowers diœcious, the male plants much smaller than the fertile ones, with leaves obscurely erose-dentate and distinctly costate: calyptra reaching the middle of the capsule, which is on a very slender pedicel 1 c.m. long, erect, cylindrical-oblong, costate when dry; lid long-conical, rostrate, erect; teeth long, closely twisted; annulus narrow.— Bull. Torr. Club, vi. 43.

Hab. On rocks, Matagorda County, Texas (*R. G. Bechdolt*).

36. **B. Donnellii.** Diœcious: stems 2 to 5 m.m. long: leaves involute, crispate when dry, open, spatulate-oblong or ovate-lanceolate, acute or submucronate, deeply canaliculate-concave, somewhat scabrous on the back, obscurely serrulate at the apex; costa stout, subpercurrent: fruit unknown. — *Tortula Donnellii,* Austin, Coult. Bot. Gaz. iii. 31.

Hab. Banks of the St. Lucie River, Florida, with *B. agraria* (*J. Donnell Smith*). Apparently a variety of one of the two preceding species.

§ 6. TORTUOSÆ. *Plants more robust: leaves longer, linear-lanceolate, flexuous, cirrhate-crispate when dry; basilar areolation loose, hyaline: capsule thin; basilar membrane none or scarcely visible.*

37. **B. cæspitosa,** Schwaegr. Monœcious: plants loosely cespitose, variable in size, soft: leaves long-linear, mucronate by the strong yellowish costa, more or less undulate: male flowers in axillary short pedicellate buds of two or three leaves: capsule oblong-ovate, more or less incurved, subcylindrical, gibbous at base, reddish, on a long flexuous pedicel, twisted when dry; teeth very long, purple, twice or thrice closely twisted; annulus none: spores minute, greenish, translucent, smooth. — Suppl. i. 120, t. 31; Sulliv. Mosses of U. States, 27. *B. cirrhata*, Brid.; Bryol. Eur. t. 149. *B. humilis*, Hedw. Spec. Musc. 116, t. 25. *Tortula humilis*, Brid.; Lindb. Trichost. 251.

HAB. Roots of trees in grassy places; common, especially in the hills of the Southeastern States, and very variable.

38. **B. tortuosa,** Web. & Mohr. Dicœcious: in large, more or less compact tufts; stems generally long (two to four c.m.), dichotomous, tomentose-radiculose toward the base: leaves densely imbricate, twisted-crispate when dry, spreading and flexuous when moist, linear-lanceolate, undulate from a thin pale colored base, short-cuspidate by the stout excurrent costa; perichætial leaves erect, half-sheathing, narrowly acuminate, whitish: capsule ovate or oblong-cylindrical, more or less arcuate, soft, yellowish when full of spores, brown when old; lid narrowly conical-rostrate; teeth very slender, much twisted; annulus none. — Bot. Tasch. 205; Bryol. Eur. t. 151. *Bryum tortuosum*, Linn. *Tortula tortuosa*, Ehrh.; Lindb. Trichost. 253.

HAB. Goat Island, Niagara Falls; Lancaster, and Alleghany Mountains, Pennsylvania; Ontario, Canada; New Brunswick, etc.

39. **B. fragilis,** Bruch & Schimp. Dicœcious: widely cespitose; stems erect, close and straight, simple and dichotomous, tomentose-radiculose at base: leaves densely imbricate and appressed, lanceolate-subulate by the excurrent semiterete whitish costa, flat and crenulate on the borders, thin and hyaline at base, minutely areolate, densely chlorophyllose and papillose on both faces in the upper part: capsule regular or slightly incurved, ovate-oblong; lid oblique, long-beaked from a conical base; teeth very slender and papillose, twisted two or

three times; annulus none. — Bryol. Eur. t. 639. *Didymodon fragilis*, Hook. & Wils. in Drumm. Musc. Amer. n. 127. *Tortula fragilis*, Wils.; Lindb. Trichost. 253.

Hab. Rocky Mountains (*Drummond*); Lake Superior (*Agassiz*); Ausable River, base of the Adirondack Mountains, New York (*Lesquereux*); limestone rocks, New Jersey (*Austin*). Very rarely fertile.

§ 7. Squarrosæ. *Plants long, widely and loosely cespitose: leaves of equal size the whole length of the stem, long-lanceolate, squarrose; cells minute, chlorophyllose, loose at the base: flowers dœcious, axillary.*

40. **B. squarrosa,** Brid. Tufts yellowish green, not tomentose-radiculose: leaves densely tufted at the top of the fertile plants, sheathing at base, recurved and incurved, squarrose, twisted-crispate when dry, long-lanceolate, undulate on the borders, serrate at the apex; costa thin, excurrent or percurrent; perichætial leaves half-sheathing: innovations bearing sometimes a number of perichætia, each with a single fruit: calyptra very narrow, fugacious: capsule small, ovate-oblong or cylindrical, a little curved; pedicel long, reddish below, yellowish in the upper part; teeth very long and slender, twice convolute, with short constricted articulations, pale purple, very papillose and fugacious; annulus narrow, simple. — Bryol. Univ. i. 833; Bryol. Eur. t. 152. *Pleurochæte squarrosa*, Lindb. Trichost. 253.

Hab. On the ground, at the roots of pines, near Lebanon, Tennessee (*J. Robinson*); Texas (*Wright*). Extremely rare, and only sterile specimens as yet found in North America.

§ 8. Syntrichiæ. *Plants robust: leaves oblong, lingulate or ovate-spatulate; cells small, thick, chlorophyllose, papillose, hexagonal above, larger, hyaline and hexagonal-rectangular below: calyptra large: capsule oblong or cylindrical, generally subarcuate, on a stout pedicel; teeth attached to a long tubular membrane spirally tessellated, entire or rarely perforated or cribrose.*

41. **B. subulata,** Beauv. Monœcious: loosely cespitose; plants short, simple or divided, radiculose at base: leaves ovate and spatulate-oblong, pointed or more or less long-mucronate by the excurrent costa, entire or serrate at the apex, plane on the borders, either entire or surrounded by a border of yellowish long thick-walled cells: male flowers on short lateral branches:

tubular base of the peristome very long; annulus double. — Prodr. 43; Bryol. Eur. t. 160, 161. *Bryum subulatum*, Linn. Sp. Pl. 1116. *Tortula subulata*, Hedw.; Lindb. Trichost. 242.

Var. **subinermis**, Schimp. Leaves shortly mucronate by the excurrent costa, with a less distinct border: capsule shorter and shorter-pedicellate. — Syn. 187.

Var. **mutica**, Schimp. Leaves shorter, broader, blunt at the apex, not margined, but reflexed on the borders.

Var. **angustata**, Schimp. Leaves longer and narrower, linear with a narrow thick margin: capsule very narrow, cylindrical, subarcuate.

HAB. Western Arizona (*Bigelow*), and at the Big Tree Grove, California (*Bolander*); Rocky Mountains (*E. Hall*); Twin Lakes, Colorado (*Wolf & Rothrock*); British Columbia (*Macoun*), a variety with entire borders and long hair-like points.

Lindberg, l. c., remarks on the synonymy of this species and its numerous varieties, that upon examination of numerous specimens of the different forms he cannot find one with characters distinct enough to separate it as a species. The surface of the leaves is more or less papillose, sometimes smooth, the costa passes above the apex in a short or long mucro, the borders are marginate by one or two rows of longer yellowish cells, or entire with an unchanged areolation, the lid and the capsule are variable in length, the peristome whitish or reddish brown, and the annulus broad or narrow.

42. **B. inermis**, Muell. Differs from the preceding in the leaves more solid, oblong, obtuse or blunt at the apex, the borders not margined, very entire, revolute in the upper part, the areolation smaller, more opaque and dense, and the capsule shorter. — Syn. i. 624. *Tortula inermis*, Mont.; Lindb. Trichost. 241. *B. subulata*, var. *inermis*, Bruch & Schimp. Bryol. Eur. t. 161, in part, and 167.

HAB. California, near the Rio Colorado (*Bigelow*).

43. **B. mucronifolia**, Bruch & Schimp. Mode of growth as in *B. subulata*, from which it differs in the leaves a little shorter with immarginate borders reflexed toward the base, the areolation looser, the costa excurrent into a longer smooth point, the lid and the pedicel of the capsule shorter, the annulus broader, the tubular often perforated membrane nearly half as long, with shorter teeth, and the male flowers smaller. — Bryol. Eur. t. 162. *Tortula mucronifolia*, Schwaegr. Suppl. i. 136, t. 34. *T. subulata*, var. *lævifolia*, Lindb. Trichost. 242.

HAB. Bare ground, limestone rocks, banks of streams, etc.; not rare.

44. **B. lævipila,** Bruch & Schimp. Monœcious: plants long and robust, in dense tufts, dichotomous, tomentose-radiculose at base: leaves glaucous green, brownish when old, open or recurved at the apex, oblong-obovate and spatulate, entire or surrounded by a broad yellow margin of round-hexagonal cells, rounded and emarginate at the apex; costa reddish-brown, passing above into a white filiform mucro, either smooth or dentate at the apex; upper areolation very dense: capsule oblong-cylindrical, slightly arched, solid, dark brown; pedicel short, purplish, twisted to the left when dry; lid slender, conical; tubular membrane one-third the length of the peristome; teeth closely and many times twisted. — Bryol. Eur. t. 164. *Tortula lævipila,* Schwaegr. Suppl. ii. 66, t. 120; Lindb. Trichost. 245.

Hab. Foot of Monte Diablo (*Bolander*), and Duncan's Mills, California (*Watson*); Nevada (*Watson*); Vancouver Island (*Lyall*).

45. **B. latifolia,** Bruch & Schimp. Diœcious: plants irregularly and loosely cespitose, dark green or blackish: lower leaves distant, oblong-obovate, the inner tufted, lingulate, close, spreading, twisted or complicate when dry; costa vanishing below the emarginate apex or passing a little beyond it: capsule short-pedicellate, oblong-cylindrical, brown; basilar membrane of the peristome one-third its length; teeth long, many times twisted; annulus simple, narrow. — Bryol. Eur. t. 164. *Tortula latifolia,* Hartm.; Lindb. Trichost. 243.

Hab. On fence-posts close to the water of a creek near San Rafael, California (*Bolander*); on trunks of *Alnus viridis,* Colorado (*E. Hall*).

46. **B. ruralis,** Hedw. Diœcious: plants widely tufted, whitish green above, brown-ferruginous below: leaves close at the apex, more distant along the stem, recurved-squarrose from the middle, half-clasping or subsheathing at base, large, oblong, rounded or emarginate at the apex, the costa passing above into a long flexuous whitish spinulose awn; inner perichætial leaves ovate, costate, acute: capsule oblong, subincurved, on a long pedicel reddish at base and yellowish above; operculum long, conical-acuminate; peristome very long, tubulose nearly to the middle; teeth purple, closely twisted. — Fund. Musc. ii. 92; Bryol. Eur. t. 166. *Bryum rurale,* Linn. Sp. Pl. 1116. *Tortula ruralis,* Ehrh.; Lindb. Trichost. 246.

Hab. On dry rocks, old trunks, sterile ground, etc. Especially common on the Pacific slope.

B. INTERMEDIA, Brid., differing from the last chiefly in the concave scarcely carinate leaves, the borders reflexed only in the middle, and the hair-point less spinulose, is recorded in Rau & Hervey's catalogue on uncertain authority. No specimen of this species has been observed in North America so far as we know.

47. **B. papillosa,** Muell. Dicœcious: plants in irregular loosely spreading tufts, green when moist, dark brown when dry: leaves erect-spreading, the lower ovate, the upper obovate-spatulate, fiddle-shaped (panduriform), very concave, slightly acuminate or rounded or obcordate at the apex, papillose on the back, with a short hair-point prolongation of the costa, which bears on its papillose upper surface crowded slightly pedicellate gemmæ, each composed of 2 to 5 clustered roundish green cells: fruit unknown. — Syn. i. 598. *Tortula papillosa,* Wils. Bryol. Brit. 135, t. 44; Lindb. Trichost. 244.

HAB. Trunks of elm trees, Massachusetts (*J. L. Russell*); Pennsylvania, New Jersey and Delaware (*James*); common around Philadelphia.

48. **B. Muelleri,** Bruch & Schimp. Very similar to *B. ruralis,* differing in its bisexual inflorescence, larger and more compact tufts, the leaves more densely crowded on the stem, open, not reflexed, broadly oblong-obtuse or rounded to a slightly spinulose awn, carinate in the middle, with borders more or less revolute in the lower part, the costa reddish and somewhat hirsute. — Bryol. Eur. t. 168. *Tortula princeps,* DeNot.; Lindb. Trichost. 247.

HAB. Common on decayed trunks in California (*Bolander, Kellogg, Watson*); Oregon (*Nevius, E. Hall*); Nevada and Western Montana (*Watson*).

TRIBE IV. GRIMMIEÆ.

Plants repeatedly dichotomous by innovations. Leaves opaque; areolation hexagonal or linear-sinuous in the lower part, minutely round-hexagonal, punctiform and chlorophyllose in the upper. Calyptra mitriform, partly or entirely covering the capsule, rarely cuculliform, smooth or furrowed, often hairy. Capsule erect, generally regular, on a straight or arcuate pedicel. Peristome generally perfect, simple, with the teeth short, flat, entire or diversely lacerated or lacunose or divided into filiform segments.

45. CINCLIDOTUS, Beauv.

Aquatic, floating in long and wide greenish black tufts attached by basilar radicles, fasciculate, rarely dichotomous. Leaves open, thickish, composed of parenchymatous cells, very minute and chlorophyllose toward the apex; costa stout, papillose on the back. Flowers dicœcious, the female terminal on primary branches; the male either terminal or agglomerate on short secondary branches, becoming lateral or terminal by age. Calyptra conical, cucullate, solid. Capsule immersed or emerging, thick. Teeth of the peristome cut into multiple filiform divisions, coherent below, free above, papillose, reddish. Annulus none. Spores large, verruculose.

1. **C. fontinaloides,** Beauv. Leaves long, lanceolate, somewhat flexuous, curved when dry, mucronate by the excurrent costa: fruit generally abundant, nearly immersed in the perichætial leaves: capsule ovate-oblong, soft, sulcate when dry; teeth large, purple, cleft from below the middle into two or three filiform simple laciniæ connected toward the base by cross-bars or trabeculate. — Prodr. 52; Bryol. Eur. t. 277. *Trichostomum fontinaloides*, Hedw. Musc. Frond. iii. 36, t. 14.

Hab. On stones in the bed of a creek, Ontario, Canada (*Macoun*), sterile specimens.

46. GRIMMIA, Ehrh. (Pl. 2.)

Plants more or less compactly tufted or pulvinate, rooting at the base only. Leaves close, open, rarely secund, lanceolate, often piliferous at the apex; borders generally entire, rarely erose-denticulate at the apex; surface more or less papillose. Peristome (rarely absent) simple, of 16 teeth, transversely articulate, lanceolate, entire or more generally variously split, papillose, purple, hygroscopical. Annulus generally present.

Subgenus I. SCHISTIDIUM. (Pl. 2.)

Areolation minutely quadrate or punctiform in the upper part of the leaves, the surface nearly smooth or with minute sparse papillæ. Flowers monœcious. Calyptra small, lobate,

covering the lid only. Capsule immersed or on a short straight pedicel. Lid broadly convex, cuspidate, falling off with the columella. Teeth lanceolate, cribrose, rarely rudimentary.

1. **G. conferta,** Funck. Leaves oblong or ovate-lanceolate, acuminate, opaque, with a short denticulate hair-point; borders slightly inflated above on the right side, reflexed toward the base: capsule ovate-globose; lid broadly convex at base with a short apiculate beak; teeth lanceolate, split and cribrose; annulus none. — Moos-Tasch. 18, t. 12; Schimp. Syn. 199. *Schistidium confertum*, Bruch & Schimp. Bryol. Eur. t. 232; Sulliv. Mosses of U. States, 36. *Grimmia apocarpa*, var. *conferta*, Muell. Syn. i. 777.

Var. **obtusifolia,** Schimp. Leaves shorter and broader, obtuse, bright green. — Syn. 200.

Var. **compacta.** Stems short, compact; tufts slender, mostly simple, compressed.

Hab. On rocks, wet or dry, plains and mountains; var. *obtusifolia*, in shaded places, common; var. *compacta*, Lake Superior (*Macoun*).

Differs from *G. apocarpa*, especially in the leaves erect and blackish when dry, with borders less recurved, the costa stouter, dilated, prominent on the back, and more channelled above, the capsule smaller, paler, of thinner texture and almost pellucid, the beak of the lid blunt and slightly shorter, and the teeth more cribrose and somewhat lacerate, orange-colored, fragile and fugacious.

G. subincurva, Aust. (Coult. Bot. Gaz. iii. 31), described from sterile specimens, is said to differ from *G. conferta* in the leaves muticous, not hyaline-apiculate, the margins less recurved and the cells of the areolation much smaller. In *G. conferta*, var. *obtusifolia*, the leaves are obtuse and not hyaline-pointed, and in all the forms of that species the margins are not reflexed or only slightly so. The author compares the species also to *Zygodon Mougeotii*, with which it was found, and finally remarks that the species is chiefly characterized by the muticous subincurved apex of the leaves, and that in the upper part of the leaves the cells are often broader than long and slightly obscure.

2. **G. ambigua,** Sulliv. Closely resembles *G. conferta*, from which it differs in the larger perichætial leaves prolonged upward into a long scabrous hyaline hair-point, the oval-oblong capsule, the scarcely perforated teeth, and the cuculliform calyptra. — Icon. Musc. i. 66, t. 41. *Schistidium ambiguum*, Sulliv. Mem. Am. Acad. n. s. iv. 170, and Mosses of U. States, 36.

Hab. Dry rocks; Santa Fé, New Mexico (*Fendler*); near Easton, Pennsylvania (*James, E. Baur*).

3. **G. apocarpa,** Hedw. More robust and not as densely tufted as the preceding: leaves open from an erect base when moist, lanceolate from the enlarged concave base, carinate above, recurved on the borders, often hyaline-denticulate at the apex; costa vanishing below the apex or excurrent into a rough pellucid point: capsule ovate, thick; lid purple with a longer acuminate beak; peristome dark purple, with broader nearly entire scarcely perforate teeth; annulus none. — Musc. Frond. i. 113, t. 39. *Bryum apocarpum*, Linn. Sp. Pl. 1115. *Schistidium apocarpum*, Bruch & Schimp. Bryol. Eur. t. 233, 234; Sulliv. Mosses of U. States, 36.

Var. **gracilis,** Nees & Hornsch. Stems longer, slender: leaves spreading all around or inclined to one side: fruits lateral by prolongation of the innovations.

Var. **rivularis,** Nees & Hornsch. Loosely cespitose, fasciculate-branching, blackish green: leaves ovate-lanceolate, blunt at the apex: capsule turbinate and wide-mouthed when empty.

Hab. On stone, rocks, walls, etc., rarely on wood; the first variety on dry rocks in mountains; the second common on rocks in streams.

4. **G. platyphylla,** Mitt. Leaves incurved and imbricate, broadly ovate, blunt at the apex or produced into a short diaphanous point by the percurrent thick costa, revolute on the borders; perichætial leaves broadly oval, oblong, angular, obtuse at the apex, loosely areolate, with long delicate meshes to near the apex. — Journ. Linn. Soc. viii. 20.

Hab. Davis Straits (*Taylor*).

This species, says the author, is in appearance like *G. apocarpa*, var. *stricta*, but the leaves are more than twice as wide and imbricated both in the wet and dry state, the perichætial with very lax areolation for two-thirds of their length.

5. **G. Agassizii.** Stems short; branches fasciculate at the apex: leaves appressed when dry, erect when moist and shining, blackish, linear-lanceolate from a slightly broader base, obtuse and coarsely sparingly dentate at the apex; costa vanishing below the apex; perichætial leaves longer and obtuse: capsule oblong; beak of the lid short and obtuse; teeth dark red, thick and entire below, pale and cribrose above. — *Schistidium Agassizii*, Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. n. 137; Sulliv. Mosses of U. States, 104.

Hab. Rocks washed by the waves; Lake Superior (*L. Agassiz*, 1848). Closely allied to *G. maritima*, from which it differs in the longer nar-

rower linear-lanceolate leaves, marked at the obtuse apex by a few large teeth and more narrowly costate, the more compact areolation, the short-beaked obtuse lid, the teeth pale red and cribrose in the upper part only, etc.

6. **G. maritima,** Turn. Densely tufted, dark green or blackish: leaves closely imbricate, curved and more or less twisted when dry, lanceolate-acuminate or mucronate, and carinate by a thick excurrent costa; borders nearly flat: capsule obovate, truncate; teeth minutely cribrose, ferruginous.—Musc. Hibern. 23, t. 3. *Schistidium maritimum*, Bruch & Schimp. Bryol. Eur. t. 235; Sulliv. Mosses of U. States, 36.

Hab. Sea coast, on rocks at Nahant, Massachusetts (*Lesquereux*).

Subgenus II. SCOULERIA.

Plants of large fine growth, dichotomous. Leaves thick, chlorophyllose. Capsule immersed, globose, on short lateral branches. Operculum fixed and persistent upon the columella. Peristome of 16 teeth, divided into 32 short broadly lanceolate-subulate segments, inflexed when moist, erect when dry.

7. **G. Scouleri,** Muell. Plants dark green or black: stem-leaves imbricate, open, spreading when moist, broadly ovate, obtuse, carinate, flat on the borders, dentate from the middle upward; costa strong, brown; cells round or hexagonal, inflated or thick-walled above, larger, subquadrate and pellucid at base; perichætial leaves similar: calyptra glabrous: capsule large, globose-turgid, thick, dark brown, with a broad orifice; lid small, flat, with a short conical apex.—Syn. ii. 654. *Scouleria aquatica*, Hook. in Drumm. Musc. Amer. n. 63, and Bot. Misc. ii. 33, t. 18; Schwaegr. Suppl. iv., t. 315.

Hab. On rocks in running water, upon the Pacific slope; Portage River (*Scouler*, who gave specimens to Drummond); on granite rocks in Merced River, California (*Bolander*); Columbia River (*Lyall*); near Portland, Oregon (*Morris, E. Hall*); Spokan Falls, abundant (*Watson*).

A beautiful and remarkable species, related to *Cinclidotus* in its mode of growth and the exserted columella, and to *Grimmia* in the areolation and other characters.

Subgenus III. GASTEROGRIMMIA.

Plants in short compact tufts. Leaves short. Inflorescence monœcious. Capsule emergent or immersed, borne on a short arcuate pedicel, ovate, ventricose on the lower side. Lid mamil-

late. Peristome none, or composed of split and perforated teeth. Annulus distinct.

8. **G. anodon,** Bruch & Schimp. Plants in dense slender whitish hairy tufts: lower leaves small, loosely imbricate, ovate-lanceolate, blunt at the apex; upper and perichætial leaves much larger, oblong-lanceolate, concave, plane on the borders, passing into a more or less elongated serrate hairy point: capsule ovate-globose, ventricose, thin-walled, enlarged at the orifice when empty; lid large, plano-convex, umbonate; annulus simple. — Bryol. Eur. t. 236; Muell. Syn. i. 780.

Hab. Limestone rocks, base of the East Humboldt Mountains, Nevada (*Watson*); Morriston, California, and Ogden, Utah (*Lapham*); Cañon City, Colorado (*Brandegee*); St. John, New Brunswick (*James*).

9. **G. plagiopodia,** Hedw. Plants short, loosely adhering in compact grayish green tufts: lower leaves imbricate, oval-oblong, obtuse, the upper larger, acuminate, prolonged into a hair-point, concave, flat on the borders; costa vanishing below the apex: capsule oblong, wide-mouthed when empty; teeth lacerate and filiform, laciniate above, entire from the middle downward, spreading open when dry, dark orange; annulus double, persistent. — Spec. Musc. 76, t. 15; Bryol. Eur. t. 236.

Var. **pilifera.** Stems erect: the upper and especially the perichætial leaves with a longer hair-point; perigonial leaves longer, the inner ones ovate-acute, the outer with a short hair-point. — *G. Brandegei*, Aust., Bull. Torr. Club, vi. 45 (?).

Hab. The variety on rocks in the Rocky Mountains, Colorado (*E. Hall, Brandegee*); on a fossil bone, Missouri (*Cope*); Ontario, Canada (*Macoun*).

Of *G. Brandegei*, Austin, we have seen only a sterile plant, agreeing exactly with those of the variety described above, and the characters taken from the fruit, as described, are exactly those of *G. plagiopodia.*

Subgenus IV. GRIMMIA, proper.

Leaves hair-pointed. Calyptra lobate-mitriform. Capsule regular, emergent or exserted on an arcuate-pedicel. Teeth cribrose or lacunose.

* *Flowers monœcious.*

10. **G. pulvinata,** Smith. Plants glaucous green or gray, pulvinate: lower leaves lanceolate-acuminate, the upper oblong-lanceolate, narrowed or rounded to a slightly rough hair-point:

capsule regularly oval, distinctly striate, costate when dry, pendent from a yellowish curved pedicel; lid convex at base, rostrate; teeth long, densely articulate below, slightly perforated and irregularly 2–3-cleft at the apex, purple; annulus large, revoluble. — Engl. Bot. t. 1728; Bryol. Eur. t. 239.

Var. **obtusa**, Muell. Capsule shorter, pedicellate, ovate-globose; lid obtusely mamillate. — *Dryptodon obtusus*, Brid. Bryol. Univ. i. 198.

HAB. On rocks, California (*Bolander*, *Palmer*); Arizona (*Bigelow*); Nevada, Utah, Western Montana, and Washington Territory (*Watson*). The variety at Fort Colville (*Lyall*), and Cache Creek, British America (*Macoun*).

* * *Flowers dicœcious.*

11. **G. contorta**, Bruch & Schimp. Plants of medium size in loose soft green tufts, becoming black toward the base: leaves incurved-spreading, crispate when dry, lanceolate toward the base, linear-subulate, diaphanous at the apex or with a very short hair-point, carinate-concave and recurved on the borders at base, complicate-carinate above, only the young ones green, the others blackish brown; cells of the areolation comparatively large, quadrate, sinuous toward the apex, longer and hexagonal-rectangular toward the base, partly chlorophyllose and partly diaphanous; perichætial leaves sheathing at base, open and subulate above: capsule oval, smooth, soft, small compared to the size of the plants, inclined on a slightly arcuate pedicel; lid convex-conical, obtuse, erose at the base; teeth bifid to below the middle or lacunose, reddish brown; annulus large, of a triple row of cells. — Bryol. Eur. t. 248; Lesq. Mem. Cal. Acad. i. 13. *Dicranum contortum*, Wahl. Fl. Carp. 346. t. 4.

HAB. Shade of the Big Trees, California (*Bolander*); sterile.

The characters of the plants and leaves agree with the above description of Schimper, but the specimens are sterile, and the species is, therefore, still doubtful for this continent.

12. **G. hamulosa**, Lesq. Plants blackish, in irregular loose tufts: leaves unequally imbricate, subfasciculate, homomallous-falcate when dry, subhomomallous, erect and hook-shaped when moist, narrowly lanceolate-subulate; costa stout, vanishing below the apex; areolation long-quadrate or equilateral at base, irregularly quadrate above; perichætial leaves longer and longer acuminate-subulate: capsule oval, smooth, thick, brown, emergent and inclined on a somewhat long curved

pedicel; teeth short, lacerate or perforate; annulus none.—Mem. Calif. Acad. i. 14.

HAB. Gravelly soil, Mount Dana, at 10,000 feet altitude (*Bolander*).

Resembles the preceding species, but is very distinct in the hamulose homomallous leaves with long subulate opaque muticous points, in the large capsule on a longer curved pedicel, the absence of annulus, etc.

13. **G. torquata,** Grev. Soft and fragile, in dense convex tufts, bright green above, blackish brown below and radiculose at base: leaves erect, spreading, spirally curved when dry, oblong-lanceolate, the lower blunt, the upper with a short hair-point, canaliculate by a slender costa; borders plane; cells of the upper areolation thick, punctiform, those of the lower part long, linear, yellowish, with thick greenish walls. Flowers and fruit unknown.—Scot. Crypt. Fl. t. 199. *G. torta*, Nees & Hornsch. Bryol. Germ. i. 179, t. 24. *Zygodon torquatus*, Liebm.; Muell. Syn. i. 682.

HAB. Near the Highlands, Rocky Mountains of British North America (*Drummond*); Vancouver Island (*Macoun*).

In one specimen the leaves are twisted and crispate at the top of the stems, much like those of *Zygodon Californicus*, which they also resemble in shape and color.

14. **G. Muhlenbeckii,** Schimp. Tufts greenish white, soft, more or less compact; stems erect, dichotomous, or branching by innovations from near the apex: leaves densely imbricate, spreading and turning upward from the middle, erect when dry, long-lanceolate, concave at the somewhat enlarged base, carinate toward the apex, plane on the borders; the lower with a short, the upper with a long rough hair-point: capsule small, emergent upon an arcuate pedicel, inclined or pendent, oval, smooth, thin, yellowish brown; lid convex at base, obtusely apiculate-rostellate; teeth lanceolate, mostly entire, sometimes bifid or perforate at the apex, reddish brown; annulus simple, narrow.—Syn. 212. *G. incurva*, Bruch & Schimp. Bryol. Eur. t. 243, not Schwaegr.

HAB. Mount Dana, California, at 11,000 feet altitude (*Bolander*).

15. **G. Watsoni.** Plants flexuous or erect, loosely cespitose, dark or blackish green below, pale green at the apex: leaves irregularly imbricate, open, variously curved, flexuous when dry, abruptly very much falcate-reflexed when moistened, narrowly lanceolate from the somewhat enlarged base, flat on the borders or slightly reflexed near the base, muticous

or apiculate with a very short pellucid point by the percurrent costa, entire or slightly crenulate at the apex: capsule ovate-oblong, very obscurely striate, emergent on a somewhat long arcuate pedicel; teeth lanceolate, nearly entire, split or perforated near the apex only; columella persisting after the dehiscence of the lid as a subulate point longer than the teeth, naked or filamentose when young; lid and calyptra as in *G. trichophylla;* annulus narrow, of a simple row of cells. —*G. ancistrodes*, Lesq. Mem. Calif. Acad. i. 13.

HAB. On rocks, Dardanelles Cañon (*Bolander*); Alderney, Marin Co., California (*Watson*).

A fine species, differing from *G. Californica* in the scarcely hair-pointed leaves, the oval-oblong capsule without a distinct collum and scarcely plicate when dry, the persistent columella, and the narrow simple annulus. It is probably the moss figured by Sullivant in Pacif. R. Rep. iv. t. 4, figs. 1^b and 3^b, on which he remarks (page 187) that it represents a variety differing from the typical forms of *G. Californica* in the strong abrupt recurvations of the leaves. The characters mentioned above show it to be distinct from *G. Californica*, as well as from *G. ancistrodes*, to which it has been referred.

16. **G. trichophylla,** Grev. Plants soft, loosely tufted, yellowish green: leaves open, flexuous, slightly crisped when dry, the lower lanceolate, shortly awn-pointed, the upper oblong at base, linear-lanceolate upward to a long nearly smooth diaphanous point, carinate-concave, borders recurved toward the base; cells of the areolation transversely oval, rectangular toward the apex, linear-sinuous toward the base, the marginal quadrate; perichætial leaves three, broad-oblong, sheathing to the middle, abruptly narrowed, lanceolate-subulate: capsule elliptical, 8-costate, thin, yellowish brown, horizontal or declined upon a long curved pedicel, flexuous and nearly erect when dry; lid with a long straight beak; teeth long, irregularly bifid to the middle, or lanceolate-subulate and more or less distinctly split along the divisural line, red, connivent in a cone when dry; annulus large, compound, falling in fragments. — Scot. Crypt. Fl. t. 100; Bryol. Eur. t. 244.

Var. **meridionalis,** Schimp. Plants longer, more densely tufted, slender: leaves shorter, with a longer hair-point: capsule smaller, subglobose, less distinctly costate; teeth smaller. —Syn. 213. *G. ancistrodes*, Mont.

HAB. On erratic blocks, both the normal form and the variety, California (*Bigelow, Bolander, Palmer, B. W. James*).

17. **G. Olneyi,** Sulliv. Very similar to *G. trichophylla*, differing in the leaves lanceolate from a more enlarged ovate base, more rigid, not flexuous, with a more compact areolation, and the borders flat and not reflexed toward the base, the capsule smooth, not furrowed when dry, the pedicel shorter, and the lid somewhat shorter beaked: the peristome, the calyptra, more deeply split on one side, and the annulus are the same in both. — Mosses of U. States 37, and Icon. Musc. 67, t. 42; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. n. 141.

Hab. On flat dry or wet rocks; Eastern States, not rare.

18. **G. Californica,** Sulliv. In loose, sometimes wide tufts: leaves open, erect, lanceolate, carinate-concave, reflexed on the borders; costa excurrent into a short hyaline denticulate hair-point: capsule obovate, subpyriform and pendent from a short arcuate pedicel; teeth short, irregularly bifid at the apex. — Pacif. R. Rep. iv. 187, t. 4, excl. var.

Hab. On rocks, California; common.

The lid, calyptra and annulus, and the general facies are the same in this species as in the two preceding. *G. trichophylla* has the stems longer, less crowded and more slender, the leaves flexuous, the capsule prominently ribbed when dry, and longer flexuous pedicels, while *G. Olneyi* has the leaves canaliculate-concave, not recurved on the borders, and linear-lanceolate from an ovate base.

Subgenus V. GUEMBELIA.

Plants erect. Leaves open, not crispate when dry, solid, generally hair-pointed, flat on the borders. Calyptra mitrate and five-lobed, or oblique and more highly split on one side, thus appearing half-cucullate, half-mitrate, or distinctly cucullate. Capsule erect on a straight pedicel, exserted or rarely immersed, regular, not costate.

* *Calyptra lobate-mitrate.*

\+ *Flowers monœcious.*

19. **G. Donniana,** Smith. Plants short, small, whitish green, pulvinate: leaves soft, pale green, blackish brown when dry, the lower small, lanceolate-acuminate, the upper much longer, narrowly lanceolate, gradually tapering into a long nearly smooth diaphanous hair-point; borders slightly thicker toward the apex; perichætial leaves longer, with the hair-point

as long as the lamina: capsule subexserted, small, thin, oval or oblong, yellowish, with a short conical obtuse orange-colored lid; teeth nearly entire, or slightly perforated toward the apex, reflexed when dry; annulus broad, of a triple row of cells, persistent. — Fl. Brit. iii. 1198; Bryol. Eur. t. 249. *G. obtusa*, Schwaegr. Suppl. i. 88, t. 25; Muell. Syn. i. 796.

Var. **curviseta.** Pedicel longer, flexuous.

HAB. On rocks, White Mountains (*Oakes, James*); the variety at Monitor, California (*Lapham*); Yakima River, Cascade Mountains (*Watson*).

20. **G. Coloradensis,** Austin. Pulvinate-cespitulose; the stems 1 c.m. long or less, fastigiately branching: leaves suberect, lanceolate or sublingulate, carinate, muticous or the upper hyaline-apiculate, more or less thickened on the borders; areolation very minute, dense, somewhat pellucid, a little larger at the base; costa slender, vanishing far below the apex; perichætial leaves erect, broader, loosely areolate at base, often subdenticulate on the borders, long-hyaline, mucronate, serrate, costate to below the apex: capsule on a very short straight pedicel, globose, with a broad orifice; teeth pale red, short, broad, subcribrose at the apex, spreading open when dry, incurved when moist; lid and calyptra not seen. — Coult. Bot. Gaz. ii. 109.

HAB. Colorado (*Brandegee*).

The author says that this species is one of the smallest of the genus. The absence of the lid and calyptra renders the relations of this moss uncertain. The characters of the leaves and areolation, the form of the capsule, and the peristome are those of *G. Donniana*, var. *elongata*, whose leaves are muticous or shortly hyaline-apiculate; but the pedicel is long.

21. **G. ovata,** Web. & Mohr. More robust than the last, pulvinate or subcespitose: lower leaves much smaller than the comal ones, ovate, lanceolate-acute, the comal oblong-concave and reflexed on the borders in the lower part, narrowly lanceolate and carinate above, tapering to a somewhat long nearly smooth hair-point; perichætial leaves larger, sheathing: capsule distinctly exserted, oval or oblong-ovate, of thick texture, light brown; lid obliquely and obtusely short-beaked; teeth long, split to the middle into two unequal segments, or lacerate and cribrose in the upper part, purple, spreading when dry; annulus broad. — Itin. Suec. 132, t. ii, fig. 4; Schwaegr. Suppl. i. 85, t 24; Bryol. Eur. t. 254.

Var. **affinis**, Bruch & Schimp. More robust: capsule large, with shorter pedicel, scarcely exserted: leaves with a longer hair-point.

HAB. Top of Mount Marcy, New York (*Lesquereux*); Western Nevada (*Watson*); Twin Lakes, Colorado (*Wolf & Rothrock*); the variety at Sante Fé, New Mexico (*Fendler*), and in the Rocky Mountains (*E. Hall*).

\+ \+ *Flowers dioecious.*

22. **G. Pennsylvanica**, Schwaegr. Plants robust, rigid, tufted or more or less widely cespitose, dark green: stem-leaves lanceolate, gradually acuminate, submuticous, enlarged, concave, and reflexed toward the base; perichætial leaves longer, tapering into a short rough hair-point: capsule nearly immersed on a pedicel not half its length, oblong-ovate, smooth when dry; lid conical-rostrate, erect; teeth purple, broadly lanceolate, split and cribrose above; annulus large. — Suppl. i. 91, t. 25; Sulliv. Mosses of U. States, 37, and Icon. Musc. 68, t. 43; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. n. 138.

HAB. On rocks, hills and mountains of the central and southern sections; common.

23. **G. calyptrata**, Hook. Plants larger, in dense loosely adhering glaucous-green whitish tufts: lower leaves gradually smaller, lanceolate, short, with a short pellucid point, the comal and perichætial much longer, lanceolate from an oblong slightly broader base and tapering into a rough hair-point reaching higher than the top of the capsule; borders flat or slightly recurved: calyptra campanulate-mitriform, irregularly rugose, plicate, 5–6-lobate, covering the capsule nearly to its base: capsule on a pedicel equalling it in length, oblong-oval, smooth when dry, slightly constricted under the broad orifice; lid conical-rostrate; teeth lanceolate, very cribrose nearly to the base; annulus none. — Hook. in Drumm. Musc. Amer. n. 60; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. n. 139; Sulliv. Icon. Musc. i. 69, t. 44. *Guembelia calyptrata*, Muell. Syn. i. 775.

HAB. Rocky Mountains, California, New Mexico, etc.; not rare on the western slope.

24. **G. leucophæa**, Grev. Stems rather stout, in wide silver-gray tufts: lower leaves very small, ovate-lanceolate, acuminate, without hair-point, the upper oblong-lanceolate, concave at the lower part, prolonged into a long very rough hair-point, decurrent, plane on the borders, narrowly costate; peri-

chætial leaves half-sheathing, erect: capsule included, elliptical or broadly oblong, contracted at the mouth, smooth when dry, brown; lid conical at base, short, obtusely beaked; teeth 2–3-cleft to the middle or cribrose below, purple, spreading when dry; annulus large. — Wern. Trans. iv. 87, t. 6, and Scot. Crypt. Fl. t. 284; Bryol. Eur. t. 257.

HAB. On flat dry sandstone rocks, in large patches; common in the southern and middle sections, and in California.

* * *Calyptra cucullate: flowers dicecious.*

25. **G. commutata,** Hueben. Tufts loose, blackish green; stems slender, long, decumbent and naked below when old: lower leaves very small, lanceolate, loosely imbricate, the upper abruptly much longer and tufted, open, curving up from the middle, concave at base, nearly tubulose above, with a short nearly smooth hair; perichætial leaves broader, pale, the inner broadly sheathing, linear-lanceolate above, with a longer pellucid hair: calyptra descending to the middle: capsule included, broadly oval, thick; lid acuminate from the conical base, or short-beaked, acute; teeth 2–3-cleft to below the middle, or nearly entire and lacunose, purple, spreading when dry; annulus very broad, dehiscent. — Muscol. Germ. 185; Bryol. Eur. t. 256. *Dryptodon ovatus,* Brid. Bryol. Univ. i. 202. *Guembelia ovalis,* Muell. Syn. i. 774.

HAB. California (*Bigelow*), and Monterey (*Watson*); Chippewa Falls, Wisconsin (*Lapham*).

26. **G. montana,** Bruch & Schimp. In short compact tufts, similar in aspect to *G. ovata;* tufts smaller: leaves ovate-oblong at base, lanceolate above and passing into a pellucid hair variable in length, very concave, plane or erect on the borders: capsule oblong, brown, thin, subexserted upon a short straight or slightly flexuous pedicel; lid short-beaked; teeth short, irregularly split, cribrose above, spreading-recurved when dry; annulus none. — Bryol. Eur. t. 250. *Guembelia montana,* Hampe, Bot. Zeit. iv. 125.

Var. **brachyodon.** Tufts smaller: leaves with a shorter hair-point: lid shorter, broadly conical, mamillate or with a short obtuse beak. — *G. brachyodon,* Austin, Bull. Torr. Club, vi. 45.

Var. **truncata.** Capsule ovate-globose; lid short-conical; teeth truncate. — *G. Jamesii,* Austin, l. c. 43; Watson, Bot.

Calif. ii. 378. *G. orbicularis*, James, Bot. King Exp. 403; not Bruch & Schimp.

Hab. On schistose rocks and granite boulders, Mission Dolores, California (*Bolander, Brewer, Lapham*); in Nevada, in the Bitterroot Mountains of Western Montana and Idaho, and on Kettle River, British America (*Watson*).

The areolation, texture and conformation of the leaves in both the varieties are the same as in the normal form; the tufts only are smaller and the hair-points generally shorter. But Schimper remarks (Syn. 2d ed., 264) that he has received specimens from Norway with smaller tufts and the leaves shortly hair-pointed. Austin describes the calyptra of *G. Jamesii* as cucullate-campanulate, slightly unequally lobate at base. It is indeed large and cucullate, but merely undulate not distinctly lobate at base, or the same as in *G. montana*. The teeth are generally truncate by maceration in var. *brachyodon*; but in well-preserved specimens they have exactly the characters of the European form. The greater and only marked difference is in the shorter lid, but this is not a constant character, as in some of the well-preserved American specimens the lid is obtusely rostrate and only slightly shorter, as it is shown in Bruch & Schimper's figures of the species.

27. **G. alpestris,** Schleich. Plants in compact glaucous green tufts: leaves gradually larger from the base of the stem upward, lanceolate from an oblong base to a nearly smooth pellucid hair-point, concave and canaliculate; borders plane; outer perichætial leaves broad, the inner shorter and narrow: calyptra large: capsule oblong-cylindrical, emergent on a short straight pedicel; lid convex, conical-obtuse; teeth nearly entire, somewhat lacunose toward the apex; annulus compound, persistent. — Nees & Hornsch. Bryol. Germ. ii. 139, t. 21; Bryol. Eur. t. 251. *Guembelia alpestris*, Hampe, l. c.; Muell. Syn. i. 772.

Hab. On rocks at Fort Colville and Pend d'Oreille Lake (*Lyall*); Utah (*Watson*).

Mitten remarks (Journ. Linn. Soc. viii. 20) that all Lyall's specimens are very dark green, but otherwise the same as the European form.

* * * *Calyptra cucullate-lobate: dioecious.*

28. **G. unicolor,** Grev. Plants widely cespitose, dark green or black; stems slender, naked and decumbent below: leaves erect-spreading, imbricate when dry, linear-lanceolate from an ovate base, blunt or obtuse or thicker at the apex: calyptra long-rostrate, mitriform-cucullate: capsule erect, oval-oblong, emergent on a thick somewhat long pedicel; lid long-beaked, straight or curved; teeth orange, very closely articu-

late, long-lacerate or split to below the middle, erect when dry; annulus very broad, of a triple row of cells. — Scot. Crypt. Fl. t. 123; Bryol. Eur. t. 260.

Hab. Rocky Mountains (*Drummond*); Bear River Gap, White Mountains (*James*); Nipogon River, Lake Superior (*A. Smith*); Thunder Bay (*Macoun*).

47. RACOMITRIUM, Brid. (Pl. 2.)

Plants generally of large size, widely and loosely cespitose, scarcely radiculose, branching by dichotomous innovations, simple and fastigiate or fasciculate by lateral more or less unequal branchlets. Leaves close, nearly equal, not tufted at the top of the stems, long-lanceolate, muticous or piliferous, canaliculate-concave, recurved on the borders; cells close, minutely quadrate in the upper part of the leaves, sinuous, linear and long in the lower part. Flowers dicœcious. Fruit acrogenous or from secondary short branchlets. Calyptra conical at base and mitriform-subulate. Capsule oblong-cylindrical, narrowed at the orifice, mostly erect. Lid narrow, subulate. Teeth of the peristome long, irregularly 2–3-cleft to below the middle or divided into two filiform nodose nearly equal segments, erect, rarely spreading when dry. Annulus compound, revoluble.

Subgenus I. CAMPYLODRYPTODON.

Plants regularly dichotomous, prostrate. Cells minute and rounded above, linear toward the base: costa narrowly two-winged above on the back. Pedicel arcuate. Teeth long, bifid to near the base.

1. **R. patens,** Hueben. Plants olive-green, fragile, in wide loose flat tufts: leaves open, long-lanceolate, muticous; costa subpercurrent: capsule inclined or pendent, emergent, oval, yellowish brown, red at the orifice; lid straight or obliquely rostrate; teeth purple, papillose; membrane orange; annulus very broad. — Musc. Germ. 199; Schimp. Syn. 226. *Bryum patens*, Dicks. Fasc. Crypt. ii. 6, t. 4. *Trichostomum patens*, Schwaegr. Suppl. i. 151, t. 37. *Dryptodon patens*, Brid. Bryol.

Univ. i. 192. *Grimmia patens*, Bruch & Schimp. Bryol. Eur. t. 246.

Hab. Between Fort Colville and the Rocky Mountains (*Drummond, Lyall*); on rocks, White Mountains (*James*).

Subgenus II. DRYPTODON.

Plants fastigiately branching; innovations simple. Cells quadrate or oval above, generally erose, very narrowly linear and sinuous at the base.

2. **R. aciculare**, Brid. Loosely and irregularly cespitose, bright or dark green, rigid, naked below: leaves more or less turned to one side, oblong at base, lanceolate, obtuse, entire, or the upper marked at the apex by a few small distant hyaline teeth: capsule oblong-cylindrical, brown, erect; lid long, narrowly subulate or acicular-beaked; teeth cleft to below the middle. — Bryol. Univ. i. 219; Bryol. Eur. t. 262. *Bryum aciculare*, Linn. Sp. Pl. 1118. *Grimmia acicularis*, Muell. Syn. i. 801.

Hab. Wet rocks, waterfalls in mountains; not rare.

3. **R. depressum**, Lesq. Plants yellowish brown, in wide loosely compressed tufts; stems very long, scarcely branching: leaves loosely imbricate, appressed when dry, open and homomallous when moist, broadly ovate, dilated and semi-auricled at the decurrent base, lanceolate above, obtuse, entire or slightly distantly denticulate at the apex; costa flat; cells of the auricles quadrate or broadly equilateral, more or less granulose, the basilar linear and continuous, the upper broadly ovate: capsule subcylindrical, not narrowed at the orifice, immersed on a short pedicel scarcely half as long as the lateral fruit-bearing innovations; teeth rarely bifid, mostly tripartite with unequal free or cohering smooth segments. — Mem. Calif. Acad. i. 14.

Hab. Falls of the Yosemite (*Bolander*).

The species resembles in size and color *R. protensum*, var. *cataractarum*, but differs in the broader and larger leaves inclined to one side, more obtuse and generally denticulate, as in *R. aciculare*, the thin base somewhat enlarged into a narrow auricle, whose reticulation is broad-quadrate like that of a *Dicranum*. The wide-mouthed capsule is nearly exactly cylindrical, sometimes slightly curved; the teeth are more irregularly divided than in *R. protensum*, and the articulations more distinct.

4. **R. Nevii**, Watson. Related to *R. aciculare* in the color of the plants and form of the leaves, but differing essentially

in the short pedicel, and the quadrate areolation of the upper part of the leaves; on the other hand, in the short pedicel of the narrowly oval or subcylindrical capsule this species resembles the last, from which it differs in the form of the leaves, the color of the plants, the more regular division of the teeth of the peristome, etc. A distinct very fine intermediate form. — Bot. Calif. ii. 381. *Grimmia Nevii*, Muell., Regensb. Flora (1873), lvi. 483, and Bull. Torr. Club, v. 6.

HAB. Portland, Oregon (*R. D. Nevius*, 1873).

SUBGENUS III. RACOMITRIUM, proper.

Plants nodose by short numerous lateral fasciculate branches. Male flowers lateral. Fruit acrogenous or sublateral. Teeth generally divided into two long filiform segments.

5. **R. Sudeticum,** Bruch & Schimp. Plants loosely cespitose, dirty green, slender, naked below: leaves spreading, divaricate, erect when dry, long-lanceolate, gradually acuminate to a short pellucid denticulate apex: calyptra nearly smooth at the apex: capsule on a short pedicel, very small in comparison to the size of the plants, elliptical or obovate; lid conical-rostrate, shorter than the capsule; teeth purple; annulus large, revoluble. — Bryol. Eur. t. 264. *Trichostomum Sudeticum*, Funck, Stirp. Crypt. *R. microcarpon*, Hedw. and Brid., and *Grimmia microcarpa*, Muell., in part.

HAB. On exposed rocks; Rocky Mountains (*Drummond*); Spokan Falls (*Watson*); Alleghany Mountains (*Sullivant*); Fairmount Park, Philadelphia (*James*); Stoney Creek, Pennsylvania (*E. A. Rau*); Catskill and White Mountains, etc.; not common.

Easily confounded with *R. patens*, but distinguished by its more slender stems, the upper leaves with diaphanous denticulate points, and the capsule half as large, on a short straight or slightly inclined pedicel.

6. **R. heterostichum,** Brid. Tufts more or less extensive and irregular, grayish green; plants long, dichotomous, erect or prostrate; branches somewhat fasciculate: leaves open or falcate-secund, long-lanceolate, subulate to a pellucid remotely dentate point, variable in length, more or less plicate: calyptra papillose at the apex only: capsule elliptical or obovate, thin, slightly constricted under the orifice when empty, yellowish brown; lid erect or curved, subulate, half the length of the capsule; teeth variable in length; annulus large, yellow. — Musc.

Recent. Suppl. iv. 79; Bryol. Eur. t. 265. *Trichostomum heterostichum*, Hedw. Musc. Frond. ii. 70, t. 25.

Hab. On rocks, Rocky Mountains (*E. Hall*); Oregon (*Nevius*); Alaska (*Kellogg*); Fort Colville (*Lyall*).

Plants variable in the length and thickness of the stems, sometimes long and very slender, in the leaves, which are either without or with a very short pellucid point, and in the capsule, which is sometimes very small and pedicellate.

7. **R. fasciculare**, Brid. l. c. Stems long, prostrate, dirty green or brownish; branches nodose, with fasciculate short branchlets: leaves spreading, incurved or recurved, narrowly lanceolate, linear from an ovate base, muticous at the apex: calyptra papillose to near the base: capsule oval or oblong, solid, on a thick pedicel; lid subulate-acute, shorter than the capsule, crenulate at base; teeth nearly regularly split their whole length into two filiform nodose segments; annulus large. — Bryol. Eur. t. 267. *Trichostomum fasciculare*, Schrad. Spicil. Fl. Germ. 61; Schwaegr. Suppl. i. 155, t. 38.

Hab. On rocks, Alleghany Mountains (*Sullivant*); foot of Mount Marcy, New York; White Mountains; Alaska, etc.

8. **R. varium.** Very similar to the last, but differing in its larger size, the leaves ovate-lanceolate, obtuse or the upper with a short entire hair-point, the costa percurrent, basilar cells of the borders few, oblong-rectangular, the lower long, confluent, crenulate, the medial oblong with transverse walls more distinct, the upper round-quadrate; perichætial leaves short, broadly ovate, convolute: capsule long-pedicellate, shining, the subulate lid nearly as long; teeth very long, narrow. — *Grimmia* (*Rhacomitrium*) *varia*, Mitten, Journ. Linn. Soc. viii. 21.

Hab. British Columbia (*Lyall*, *Douglas*); Observatory Inlet.

The author remarks that the leaves are intermediate between those of *R. fasciculare* and *R. canescens*, wanting, however, the loosely areolate auricles at the base of the latter, and that the moss needs further observation, but can scarcely be considered as a form of *R. fasciculare*.

9. **R. microcarpum**, Brid. l. c. Plants smaller than in the last, ramulose-nodose: leaves crowded, spreading and diversely curved or falcate-secund, more enlarged at base, lanceolate to a short diaphanous serrulate point; cells of the whole lamina linear, nodulose: capsule small, cylindrical-elliptical or somewhat club-shaped, thin, soft, yellowish brown; lid short-beaked; annulus large, revoluble. — Bryol. Eur. t. 268. *Trichostomum microcarpum*, Funck, l. c.

HAB. Moist rocks in mountains; Alleghany Mountains (*Sullivant*); White Mountains (*James*); Oregon (*Hall*); Cœur d'Alene Lake, Idaho (*Watson*).

10. **R. lanuginosum,** Brid. Tufts very wide, thick, grayish white; plants long and slender, dichotomous and ramulose; lateral branches numerous: leaves very close, long, open, erect or recurved and falcate-secund at the apex, narrowly costate, narrowly lanceolate, bordered from the middle upward by a pellucid ciliate-dentate papillose membrane, gradually passing into a pellucid more or less deeply ciliate-dentate point; cells of the margin very small, punctiform, those of the lamina linear, deeply crenulate: calyptra rough at the apex only: capsule oblong-ovate, solid, with a short rough pedicel; teeth long, regularly bifid; annulus very broad. — Musc. Recent. Suppl. iv. 79; Bryol. Eur. t. 269. *Trichostomum lanuginosum*, Hedw. Musc. Frond. iii. 3, t. 2. *T. Canadense*, Michx. Fl. Bor.-Am. ii. 296?

HAB. On granite rocks in mountains; common.

11. **R. canescens,** Brid. l. c. Plants in loose wide flat yellowish green or whitish tufts; stems erect, dichotomous; lateral branchlets short: leaves spreading, curved up or down, often turned to one side, oblong at base, deeply carinate, with borders reflexed from the base to the apex, lanceolate to a pellucid crenulate point or blunt at the apex, papillose over the whole surface: calyptra with a long subulate point, rough at the apex only: capsule conical, narrow at the orifice, angular when dry, coriaceous, on a long purple pedicel, which is flattened and twisted to the left when dry; lid acute or needle-shaped, as long as the capsule, erect or oblique; annulus and peristome as in the last species. — Bryol. Eur. t. 270, 271. *Trichostomum canescens*, Hedw. Musc. Frond. iii. 5, t. 3.

Var. **ericoides,** Bruch & Schimp. Lateral branches short, obtuse, very numerous, aggregated, nodose: pellucid point of the leaves short. — *R. ericoides*, Brid. l. c. 78.

Var. **lutescens.** Leaves longer, yellowish, pellucid, the surface mostly smooth or indistinctly papillose; borders of the hyaline point denticulate (not rugose-papillose): capsule scarcely plicate, not angular when dry.

HAB. On rocks in mountain districts; the first variety on rocks in arid places, Sitka (*Bischoff*), and Oregon (*Hall*); the second on shaded rocks, California (*Bolander*).

48. HEDWIGIA, Ehrh. (Pl. 2.)

Stems dichotomous and fastigiate-ramose, radiculose at base. Leaves 8-ranked, papillose especially on the back; cells of the areolation all in distinct series, very small, quadrate or rectangular, more elongated and sublinear in the middle of the lamina toward the base only. Flowers gemmiform, monœcious. Calyptra conical-mitrate, entire, covering the lid only, fugacious. Capsule globose, immersed in the perichætium. Lid broadly convex.

1. **H. ciliata,** Ehrh. Loosely cespitose, pale green: leaves spreading all around, curved up at the apex, or turned to one side, densely imbricate when dry, concave, oblong-lanceolate, narrowed to a short apex rendered pellucid by the absence of chlorophyll, crenulate on the borders, subdecurrent and yellowish at the point of insertion; perichætial leaves diaphanous, longer-acuminate, flexuous, ciliate on the borders: calyptra smooth or with a few hairs: capsule globose, light brown, red at the orifice; collum short, inflated; lid plano-convex with or without mamilla. — Hann. Magaz. 1781, 109; Hedw. Musc. Frond. i. 109, t. 40; Bryol. Eur. t. 272, 273. *Bryum ciliatum,* Dicks. Crypt. Fasc. iv. 6. *Pilotrichum ciliatum,* Muell. Syn. ii. 164.

Var. **leucophæa,** Schimp. More robust and more densely falcate: leaves broader, without chlorophyll, pellucid two-thirds of their length.

Var. **secunda,** Schimp. Stems slender, long, prostrate: leaves less crowded, secund, with a short pellucid point.

Var. **viridis,** Schimp. Leaves bright green to the apex or nearly so.

Var. **striata,** Schimp. Leaves plicate, reflexed on the borders, yellowish green: lid convex-conical.

Hab. On rocks; very common, and variable according to the localities. Var. *viridis* is not rare on the perpendicular face of large boulders of sandstone or granite in shaded or humid places.

49. BRAUNIA, Bruch & Schimp.

Plants widely cespitose, diffusely branching, stoloniferous. Leaves, areolation, and inflorescence as in *Hedwigia.* Calyptra

large, cucullate, descending to the middle or to the base of the capsule, long-beaked, smooth, fuscous. Capsule long-pedicellate, narrowly elliptical, regular, subincurved, with a short obconical diffluent collum, rarely subglobose, with a narrow orifice, wide-mouthed when deoperculate.

Subgenus I. PSEUDOBRAUNIA.

Leaves diaphanous at the apex, not plicate; areolation quadrate on the borders, elongated, linear or equilateral in the middle, fusiform toward the apex, papillose on the back. Capsule long-pedicellate, pyriform or turbinate; lid short-conical, mamillate.

1. **B. Californica,** Lesq. Plants in loose tufts, diversely much divided; branches erect, julaceous, generally thicker at the apex, simple or divided into short branchlets, sometimes flagellate: leaves appressed when dry, spreading when moist, subdecurrent at base, from oblong to broadly ovate, narrowed into a pellucid more or less elongated crenulate flexuous apex; borders reflexed: capsule lateral by elongation of the branches, pyriform, distinctly necked, truncate and enlarged at the orifice when empty. — Trans. Amer. Phil. Soc. xiii. 8; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. (ed. 2), n. 226; Sulliv. Icon. Musc. Suppl. 41, t. 27.

Var. **pilifera.** Leaves more abruptly acuminate into a pellucid point: capsule more enlarged at the orifice when dry, and more distinctly plicate. — *Hedwigia pilifera*, Mitt. Journ. Linn. Soc. viii. 45.

Hab. Metamorphic rocks in the mountains of California; Monte Diablo, etc. (*Bolander*); the variety on rocks, Vancouver Island (*Lyall*). Common on the Pacific Coast and very variable.

Modified as the genus is here it includes both the genera *Hedwigidium* and *Braunia* of Bruch & Schimper. In the description of *B. Californica*, Sullivant (Icon. Musc. Suppl. 41) rightly remarks that this species does not fall naturally into any of the genera of Schimper's *Hedwigiaceæ*; that it has the short plicate capsule of *Hedwigidium*, and very nearly its calyptra and operculum, the long pedicel of *Braunia*, and somewhat the same shape of leaf and areolation; but that the genus *Braunia* differs especially in its long smooth elliptical capsule, the long operculum and calyptra, and the leaves opaque, not pellucid to the apex. The moss described above has also a degree of affinity with *Hedwigia*, but a difference equally

well marked in some of the characters, especially in the long pedicel and the leaves reflexed on the borders. It differs from *Braunia* in the form of the capsule, and the leaves not plicate, but papillose on the back. The *Hedwigieæ*, like the *Cinclidoteæ*, are cladocarpous mosses, the flowers being terminal on short lateral branches. Mueller places them in the *Hypnaceæ* as species of *Pilotrichum* or *Neckera*, while Mitten refers them to the *Leucodonteæ*.

Tribe V. ORTHOTRICHEÆ.

Plants tufted. Stems dichotomously fastigiate by innovations, short and erect, or long, creeping and decumbent with short erect flowering branchlets. Leaves equal except at the base of the innovations, reflexed or squarrose when moist, subimbricate or cirrate-crispate when dry, terete-costate, opaque, minutely papillose; areolation minute, punctiform, chlorophyllose in the upper part, hyaline, longer and narrow or rectangular-hexagonal in the lower. Calyptra mitriform, subcylindrical, furrowed or plicate, generally hairy (inflated and cucullate in *Amphoridium* and *Drummondia*). Capsule on an erect pedicel, immersed or emergent, symmetrical, erect, often striate. Lid straight-beaked. Peristome simple or double, rarely none, the outer of 8 bigeminate broadly lanceolate teeth, or of 16 geminate flat teeth distantly articulate (bifid to the base in *Ptychomitrium*); the inner of 8 or 16 free cilia.

50. COSCINODON, Sprengel. (Pl. 4.)

Leaves piliferous, loosely reticulate at base, not crispate. Calyptra covering the capsule to the base or to the middle. Lid very large. Teeth of the peristome broadly lanceolate, distantly articulate, generally very cribrose, rarely entire, granulose, dark purple.

1. **C. pulvinatus,** Spreng. Dioecious: plants densely tufted, glaucous or whitish green: leaves oblong and concave at base, plicate in the middle, lanceolate to a pellucid slightly denticulate hair-point: capsule ovate, somewhat emergent, narrowed to the pedicel, wide-mouthed when empty; lid nearly as

long as the capsule; teeth more or less cribrose, reflexed when dry. — Einleit. Stud. Crypt. 281; Bryol. Eur. t. 230. *Grimmia cribrosa*, Hedw. Musc. Frond. iii. 73, t. 31. *C. cribrosus*, Spruce; Muell. Syn. i. 765.

HAB. Alaska (*Harrington*).

2. **C. Wrightii**, Sulliv. Very small, densely tufted, dirty or whitish green: leaves closely imbricate, broadly oval or obovate, concave, spoon-shaped, erose-denticulate from below the apex, rapidly narrowed to a serrate hair-point twice as long as the leaf and formed by the stout excurrent costa; basilar areolation loose, pellucid, oblong, that of the upper part smaller and oblong-oval, chlorophyllose in the middle, pellucid toward the apex: flowers monœcious, the male on terminal branchlets: calyptra descending to below the middle of the capsule, pluriplicate: capsule immersed on a very short slightly curved pedicel, erect, oval-oblong, truncate at base, thin, smooth when dry; lid conical, rostellate; teeth purple, lanceolate, irregularly 2–3-cleft at the apex, cribrose at the base; annulus large, falling off in fragments. — Mosses of U. States, 38, t. 4, and Icon. Musc. i. 71, t. 45; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. n. 132. *Grimmia Wrightii*, Austin, Bull. Torr. Club, vi. 46.

HAB. On rocks; San Marcos, Texas (*Wright*); Sante Fé, New Mexico (*Fendler*); Cañon City, Colorado (*Brandegee*).

3. **C. Raui.** Plants cespitose, dirty green: leaves obovate, loosely imbricate or spatulate, rapidly acuminate into a somewhat long denticulate pellucid hair-point, plane and entire on the borders; costa stout, vanishing below the slightly erose-dentate apex: flowers monœcious, the male in separate axillary buds near the base of the perichætial leaves: calyptra large, plicate, covering the capsule to the middle: capsule oblong-oval, rounded or subtruncate at base, thin; lid with a broad conical beak; teeth lanceolate, acuminate at the apex, entire, split merely or perforated here and there on the line of division, erect when moist, open when dry; annulus broad, persistent. — *Grimmia* (*Coscinodon*) *Rauei*, Austin, Bull. Torr. Club, vi. 46.

HAB. Colorado (*Brandegee*).

A fine species, separated from the preceding by the leaves nearly entire on the borders, the costa vanishing below the apex, the inflorescence, the peristome, etc.

51. PTYCHOMITRIUM, Bruch & Schimp. (Pl. 2.)

Plants of various size, fasciculate-subcespitose, branching by simple innovations from the base. Leaves long, often curling; cells of the areolation minute, round or quadrate, opaque in the upper part, linear-elliptical or hexagonal-rectangular at base. Calyptra covering the capsule to the middle, plicate, naked or squamulose, sublobate on the borders. Capsule symmetrical, erect, on a long straight pedicel. Lid acicular. Teeth narrowly linear-lanceolate, long, divided to near the base into two subulate free or partly agglutinate rarely entire segments. Annulus large, compound.

SUBGENUS I. PTYCHOMITRIUM, proper.

Plants large, in soft tufts. Leaves narrowly lanceolate, acuminate, dentate at the apex. Capsule single or many from the same perichætium. Teeth equally filiform-bifid. Flowers monœcious.

1. **P. Gardneri,** Lesq. Tufts dark green: leaves close, oblong, with borders slightly reflexed, lanceolate, acuminate, sharply denticulate above: calyptra smooth: capsule oval oblong; lid long, needle-form, persistent; teeth thick, generally cleft nearly to the base into three blood-red segments; annulus compound. — Mem. Calif. Acad. i. 16.

HAB. On rocks; Dardanelles Cañon, California (*Bolander*).

The species differs from the European *P. polyphyllum* in its larger size and green color, the leaves shorter, broader, and more acutely dentate, the basilar areolation longer, the upper quadrate and more compact, the shorter pedicel, the pale brown capsule longer and with a larger lid, the teeth broader and trifid, the annulus narrower, etc. The male flowers are rarely axillary, but generally placed two or more at the base of the vaginule within the perichætium.

SUBGENUS II. NOTARISIA.

Plants very small, loosely tufted. Leaves shorter, muticous, entire. Capsule solitary, shorter-pedicellate. Teeth narrower, linear-lanceolate and entire, or broader and divided above into two or three unequal segments, spreading when dry.

2. **P. incurvum,** Sulliv. Plants dark green or yellowish brown when old: leaves erect, slightly incurved when moist, twisted-crispate when dry, the lower very small, gradually larger toward the top of the stems, linear-lanceolate, more or less obtuse, thick, opaque, plane on the borders; costa broad, vanishing with or below the apex; perichætial leaves similar: male buds axillary or cladogenous: calyptra mitriform, covering the capsule to below the middle, split and plicate to the base of its long beak: capsule oval, erect; teeth 16, long-subulate, distantly articulate, entire, papillose. — Mosses of U. States, 35, and Icon. Musc. 63, t. 39. *Weissia incurva,* Schwaegr. Suppl. ii. 51, t. 116. *P. pusillum,* Bruch & Schimp. Lond. Journ. Bot. (1843) ii. 665, not Bryol. Eur.; Sulliv. Musc. Allegh. n. 135. *Grimmia Hookeri,* Drumm. Musc. Amer. n. 61.

Hab. On exposed rocks, especially sandstone; Eastern New York, and southward to Georgia; very common in Southern Ohio; Canada, near Niagara Falls (*Drummond*).

3. **P. Drummondii,** Sulliv. Larger than the last and more loosely tufted, the leaves more open, spreading and reflexed when moistened, lanceolate, more distinctly acute and denticulate-serrate on the borders: peristome attached far below the orifice of the capsule, the teeth shorter, joined in pairs, closely articulate, split at the apex into two or three irregular short segments; annulus wanting, and spores larger. — Mosses of U. States, 36, and Icon. Musc. 65, t. 40. *Grimmia Drummondii,* Hook. & Wils.; Wils. in Hook. Journ. Bot. (1841) iii. 90, t. 3, and iv. 422, t. 25, B.

Hab. On trees, from Southern Virginia and Tennessee southward.

4. **P. pygmæum,** Lesq. & James. Plants very small, olive-green: leaves close, spreading when moist, twisted when dry, linear from the more enlarged ovate base, muticous, dark green, smooth; costa vanishing far below the apex: male flowers axillary in buds at the base of the perichætium: calyptra large, covering the capsule to its base: capsule on a short reddish pedicel, oval, with a collum one-third as long as the sporangium; teeth nearly equal, linear-subulate, papillose, reddish, joined in pairs at base, some connate their whole length; articulations indistinct. — Proc. Am. Acad. xiv. 136.

Hab. On stones (?) near the Neosho River, Kansas, and at Bolivar, Missouri (*E. Hall*).

This species, the smallest of the genus, is distinct in its small size, the obscure areolation in the upper part of the leaves, the cells hyaline and hexagonal at the base, the well-marked neck of the capsule extending one-third of its length, and the teeth united in pairs, entire or agglutinate their whole length.

52. GLYPHOMITRIUM, Brid.

Plants very small, simple or sparingly branched, tufted. Leaves ovate and lanceolate, opaque; perichætium long, the inner leaves sheathing nearly to the apex. Flowers monœcious, axillary. Calyptra large, descending to below the base of the capsule, many times split and plicate. Capsule globose, solid, erect, on a somewhat long pedicel. Lid conical-acuminate. Teeth of the peristome 16, lanceolate, very entire, approximate in pairs, with hyaline borders. Annulus none. Spores large.

1. **G. Canadense,** Mitten. Leaves lanceolate, tapering to an acute or blunt point, the borders recurved from the base to the middle; cells oblong near the base, narrower at the angles, gradually becoming round above; perichætial leaves very broadly ovate, convolute, short-apiculate: calyptra rugose at the apex: capsule oval, on a short pedicel 5 or 6 m.m. long. — Journ. Linn. Soc. viii. 21.

Hab. British America (*Drummond*).

Resembles the European *G. Daviesii*, but differs in the oval capsule, the short pedicel, and the shorter stems.

53. AMPHORIDIUM, Schimp. (Pl. 2, as *Zygodon.*)

Plants soft, yellowish or dirty green above, black or brown below. Leaves soft, carinate, crispate when dry. Flowers monœcious or dicœcious; perichætium sheathing. Calyptra cucullate, small, fugacious. Capsule short-pedicellate, without peristome, contracted under the orifice, urceolate when dry and empty.

1. **A. Lapponicum,** Schimp. Monœcious: stems brittle, 2 to 4 c.m. long: leaves lanceolate, acute, the upper longer, spreading or curved back when moist, crispate when dry, bright green when young; costa vanishing below the apex: male flowers in axillary sometimes aggregate buds: capsule

emergent, brown, reddish-striate, oval, with an inflated neck nearly as long as the sporangium; pedicel short, pale. — Syn. 247. *Gymnostomum Lapponicum*, Hedw. Musc. Frond. iii. 10, t. 5. *Zygodon Lapponicus*, Bruch & Schimp. Bryol. Eur. t. 206; Sulliv. Mosses of U. States, 32.

Hab. Fissures of rocks; most abundant in the mountains. June.

2. **A. Mougeotii,** Schimp. Differs from the last in its larger more pulvinate tufts, the plants slightly curling, yellowish green above, ferruginous below, with few radicles: the leaves longer and narrower, with borders recurved toward the base, the perichætial enlarged, not tubulose, sheathing near the base only, narrower; the capsule on a pedicel twice as long and distinctly emergent, the beak of the lid longer acicular; and the flowers diœcious. — Syn. 248. *Zygodon Mougeotii*, Bruch & Schimp. Bryol. Eur. t. 206; Sulliv. l. c.

Hab. White Mountains; Wissahickon, near Philadelphia (*James*), sterile.

3. **A. Californicum.** Diœcious: plants soft and loosely pulvinate, yellowish green above, ferruginous and radiculose below: leaves very crispate and twisted when dry, spreading and flexuous when moist, narrowly lanceolate, acuminate, deeply canaliculate-carinate; costa excurrent; borders revolute below, flat and remotely sharply denticulate above; upper areolation minute, quadrate, not inflated; perichætial leaves narrower and more acute, not sheathing, slightly subrevolute on the borders: capsule small, oval, urceolate, subexserted on a short somewhat arcuate pedicel: male plants stouter. — *Zygodon Californicus*, Hampe; Muell. Bot. Zeit. xx. 361; Lesq. Trans. Amer. Phil. Soc. xiii. 6; Sulliv. Icon. Musc. Suppl. 47, t. 32.

Hab. On shaded rocks; San Jose Valley, California (*Bauer*); Dardanelles Cañon, etc. (*Bolander*); near the British boundary (*Lyall*).

The fertile plants had not been discovered by Hampe, who considered the inflorescence as probably diœcious.

4. **A. Sullivantii.** Plants long, slender, flexuous, in loose intricate yellowish brown tufts, beset with a few bundles of radicles sometimes attached to the apex of the leaves: leaves remote, recurved-spreading, lanceolate from the slightly decurrent base, concave, entire, with borders reflexed up to the middle, complicate, distantly serrate upward; costa percurrent: flowers and fruit unknown. — *Zygodon Sullivantii*, Muell. Syn. i. 679; Sulliv. Mosses of U. States, 32, and Icon.

Musc. i. 51, t. 32; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. n. 114. *Syrrhopodon excelsus*, Sulliv. Musc. Allegh. n. 170.

Hab. Rocks on the top of Grandfather Mountain, North Carolina (*Gray & Sullivant*); summit of Black Mountains, in same State, on branches and rocks (*Lesquereux*).

5. **A. cæspitosum.** Much like *A. Mougeotii* in size and aspect, differing in the leaves erect at base, open and incurved toward the apex, gradually acute, distantly serrulate, the basilar cells oblong-rectangular, ovoid in the middle, round above. — *Didymodon cæspitosus*, Mitt. Journ. Linn. Soc. viii. 18.

Hab. Vancouver Island (*Lyall*).

54. DRUMMONDIA, Hook. (Pl. 2.)

In wide compressed tufts, the stems divided into long creeping shoots with very short branches. Leaves crowded. Calyptra large, cuculliform, originally conical, as in *Schlotheimia*. Teeth of the peristome 16, short, truncate, entire, densely trabeculate, smooth and thin.

1. **D. clavellata,** Hook. Tufts dark green, blackish inside; stems prostrate, naked, radiculose on the lower side the whole length; branches numerous, short, erect, often prolonged into long creeping shoots around the tufts: leaves open-erect, ovate-lanceolate, blunt or acute, concave, firm, costate-sulcate to near the apex; areolation dense, punctiform; perichætial leaves similar: flowers diœcious, terminal or lateral by innovations: calyptra inflated, somewhat plicate at base, reaching to the base of the capsule: capsule terminal on short erect branches, short-pedicelled, ovate-globose, microstome, thin, quite smooth; lid obliquely rostrate; annulus none. — Drumm. Musc. Amer. n. 62; Muell. Syn. i. 687; Sulliv. Mosses of U. States, 32, and Icon. Musc. 52, t. 33. *Macromitrium*, Schwaegr. *Gymnostomum prorepens*, Hedw. Spec. Musc. 35, t. 3.

Hab. On trees; Northern and Middle States; common.

55. ULOTA, Mohr. (Pl. 2.)

Leaves long, lanceolate, flexuous, crispate and twisted when dry; cells at the middle of the concave base linear and chlorophyllose, enlarged and hyaline on the borders. Flowers monœ-

cious, the male gemmiform. Calyptra yellow, deeply split at base, obtusely plicate, generally covered with long flexuous yellowish hairs. Capsule exserted, narrowed into a long collum, twisted to the left when dry. — *Weissia*, Ehrh.

* *Primary stems creeping: leaves scarcely crispate when dry.*

1. **U. Drummondii,** Brid. Tufts yellowish green: leaves linear-lanceolate from an ovate base, the comal longer: male flowers axillary: calyptra somewhat hairy: capsule exserted on a long pedicel, ovate-clavate or fusiform, obscurely 8-sulcate, light brown, distinctly 8-costate to the base when old; lid conical-acuminate, whitish at the apex, yellow at base; teeth 16, whitish. — Bryol. Univ. i. 299. *Orthotrichum Drummondii*, Grev. Scot. Crypt. Fl. t. 115; Bryol. Eur. t. 210. *Weissia Drummondii*, Lindb. Musc. Scand. 28.

HAB. Canada (*Drummond*).

We have been unable to find this species in any of the sets of Drummond's mosses, though Schimper mentions it as sent from Canada by Drummond. Like the following it is distinct from all the other species in its long creeping stems, and from *U. Ludwigii* in its more robust habit, the form of the capsule, etc.

2. **U. Ludwigii,** Brid. Stems somewhat creeping or decumbent: leaves linear-lanceolate, plane or slightly undulate on the borders, open when moist, slightly twisted when dry: capsule clavate-pyriform, thin, yellowish brown, abruptly contracted and plicate at the orifice when deoperculate and dry; teeth erect when dry, close, whitish, with irregular fugacious fragments of an internal membrane as cilia. — Musc. Recent. Suppl. iv. 112; Schimp. Syn. 254. *Orthotrichum Ludwigii*, Brid. l. c. ii. 6; Schwaegr. Suppl. i. 2. 24, t. 51; Bryol. Eur. t. 225; Sulliv. Mosses of U. States, 34. *Weissia coarctata*, Lindb. l. c.

HAB. Small trunks and branches of trees; common in mountainous regions.

* * *Leaves cirrate-crispate when dry.*

3. **U. curvifolia,** Brid. l. c. Tufts loose, yellowish brown or black; stems erect from a decumbent base: leaves linear-lanceolate, acutely carinate, plane on the borders, densely papillose: calyptra deeply lobate, pale: capsule small, shorter-pedicellate, ovate, striate, costate to the base when dry; teeth bigeminate, separated to the middle, lacunose at the apex; cilia

8, of a double row of cells, equal in length.—*Orthotrichum curvifolium*, Wahl. Fl. Lapp. 363; Bryol. Eur. t. 226. *Weissia curvifolia*, Lindb. l. c.

HAB. Canada (*Drummond*, fide Schimper).

As in the case of *U. Drummondii*, we have been unable to find this species in any of our sets of Drummond's mosses.

4. **U. Bruchii**, Hornsch. Leaves linear-lanceolate from an enlarged ovate concave base, long, flexuous, twisted when dry; perichætial leaves erect, sulcate lengthwise at base; basilar cells long and narrow, vermicular, thick-walled; those of the borders enlarged, quadrate: calyptra deeply split, very hairy: capsule exserted on a long pedicel, oval, long-necked, 8-striate, pyriform and narrowed at the orifice when empty; teeth long, bigeminate, reflexed when dry; cilia 8, rarely 16, filiform, as long as the teeth, or when 16 alternately longer and shorter.—Brid. Bryol. Univ. i. 794. *Orthotrichum coarctatum*, and *O. dilatatum*, Bruch & Schimp., Bryol. Eur. t. 227. *O. Bruchii*, Wils. Bryol. Brit. 188, t. 45; Sulliv. Mosses of U. States, 34. *Weissia Bruchii*, Lindb. l. c.

HAB. White Mountains (*Oakes*); Upper Canada (*Drummond*).

Similar to *O. crispum*, but more robust, the leaves less crispate, rather twisted when dry, the capsule larger, contracted and narrowed at the mouth when dry.

5. **U. crispa**, Brid. Tufts soft, yellowish green on the outside, ferruginous within: leaves similar to those of the last species, crispate when dry: calyptra very hairy: capsule oval, with a very long collum descending to near the base of the short pedicel, constricted under the orifice, much lengthened, fusiform, deeply sulcate when dry and empty; teeth 8, confluent, rarely separated into 16, lanceolate; dividing line distinct; cilia 8, stouter and shorter than in the last.—Musc. Recent. Suppl. iv. 112. *Weissia ulophylla*, Ehrh. Beitr. i. 191. *Orthotrichum crispum*, Hedw. Musc. Frond. ii. 96, t. 35; Bryol. Eur. t. 228; Sulliv. l. c.

Var. **minor**. Plants smaller; leaves subovate at base.—*U. intermedia*, Schimp. Syn. (ed. 2) 305?

HAB. Trunks and branches of trees on mountains; not rare. The variety near Lake Huron, British America (*Drummond*, n. 153).

6. **U. Americana**, Mitt. Differing from *U. crispa* only in its shorter stem, the leaves twisted-crispate (not appressed-twisted, as described by the author), the base of the leaves sub-

oval, not generally as enlarged as in *U. crispa*, resembling in that point those of *U. crispula*. — Journ. Linn. Soc. viii. 26.

HAB. Lake Huron (*Todd*); British America (*Drummond*, n. 153, with *U. Bruchii*).

As completing the diagnosis of the species, the author says that the cells in the middle of the lanceolate part of the leaves number three within the thousandth part of an inch, and only two in *U. crispa*, and two and a half in *U. crispula*. In the plants we have examined from Drummond's sets, the corresponding cells of *U. americana* are generally broader than in *U. crispa*. The borders of the leaves also are flat and entire, not recurved nor suberose as described by Mitten. Specimens are frequently much mixed in the Drummond sets, and it appears that in our sets, at least, n. 153 merely represents a variety of *U. crispa*, apparently the *U. intermedia* of Schimper.

7. **U. crispula,** Brid. Differing from *U. crispa* in its smaller size, the green color of the tufts becoming ferruginous or brown with age, the leaves a little shorter and broader, more twisted-crispate when dry, the capsule shorter and with shorter neck, thin, more narrowly striate, pale yellow, shortened pyriform-truncate and open-mouthed or slightly contracted under the orifice when dry and empty, and in the shorter teeth. — Bryol. Univ. i. 793. *Orthotrichum crispulum*, Bruch; Bryol. Eur. t. 228; Sulliv. Mosses of U. States, 34. *Weissia crispula*, Lindb. l. c.

HAB. With the former, but more common; plains and hilly districts of the middle and northern zones.

8. **U. phyllantha,** Brid. Densely tufted, greenish brown: leaves long, linear-lanceolate, much twisted and beautifully circinate; costa percurrent, often thickened and bearing at the apex an agglomeration of small brown articulate cylindrical bodies: flowers and fruit unknown. — Musc. Recent. Suppl. iv. 113. *Orthotrichum phyllanthum*, Steud.; Bryol. Eur. t. 223. *O. fasciculare*, LaPyl.; Brid. Bryol. Univ. i. 790. *Weissia phyllantha*, Lindb. l. c.

HAB. Trunks of trees, Oregon (*E. Hall*); Vancouver Island (*Wood*); Newfoundland (*LaPylaie*).

* * * *Leaves striate, rigid.*

9. **U. Hutchinsiæ,** Schimp. Tufts greenish brown; plants erect, brittle when dry: leaves close, imbricate, rigid when dry, erect, slightly open when moist, oblong-lanceolate, acute from the ovate base; borders reflexed: calyptra very hairy: capsule on a more or less long pedicel, gradually narrowed to a long

collum, oval, 8-striate its whole length, 8-plicate when dry, yellowish, gradually narrowing to the orifice when dry; teeth 8, linear-lanceolate, bigeminate, entire or bifid at the apex, reflexed when dry; cilia 8, a little shorter than the teeth. — Coroll. 41. *Orthotrichum Americanum*, Beauv. Prodr. 80. *O. Hutchinsiæ*, Smith, Engl. Bot. t. 2523; Bryol. Eur. t. 226; Sulliv. Mosses of U. States, 34. *Weissia Americana*, Lindb. l. c.

HAB. On granite rocks in the mountains, common.

10. **U. Barclayi**, Mitt. Plants short, loosely cespitose, yellowish brown: leaves erect, open when moist, appressed when dry, obovate, concave at base, lanceolate, acute or acuminate, carinate, plane on the borders; costa vanishing below the apex; upper cells angularly round, smooth, the lower oblong, hyaline: calyptra conical, with a few short hairs: capsule broadly oval, passing down to a long pedicel, thicker in the upper part; teeth 8, bigeminate, with 15 or 16 articulations, linear, punctulate; cilia 8, narrow, as long as the teeth. — Journ. Linn. Soc. viii. 26; Sulliv. Icon. Suppl. 75, t. 56.

HAB. Sitka (*Barclay*).

Similar to *Orthotrichum Japonicum*, Sulliv. & Lesq., in Rogers North Pacif. Expl. Exped., and the two may represent varieties of one species.

56. ORTHOTRICHUM, Hedw.

Plants pulvinate, rooting at base in the axils of the branches. Leaves striate when dry; cells of the areolation round-hexagonal or oval, more or less chlorophyllose, minutely papillose or rarely smooth in the upper part, the lower larger, hexagonal-rectangular, hyaline. Flowers generally monœcious, the male in separate lateral buds. Calyptra campanulate-mitrate, split and carinate-plicate at base, deeply sulcate at the apex, hairy or naked. Capsule generally immersed, 8–16-striate, rarely smooth when dry. Peristome simple or double, the outer of 8 bigeminate or of 16 geminate teeth, the inner of 8 or 16 cilia. Annulus none or very narrow. — *Dorcadion*, Adans., in Lindb. Syst.

* *Plants of medium size: leaves solid, striate: capsule more or less exserted; peristome simple.*

1. **O. anomalum**, Hedw. Stems erect, mostly simple: lower leaves distant, the upper densely crowded, open, ovate-

lanceolate, revolute on the borders, distinctly papillose; basilar areolation rectangular, the upper round-hexagonal: calyptra dirty brown, hairy: capsule exserted on a comparatively long pedicel, ovate-oblong, indistinctly 16-striate, constricted in the middle when dry; teeth light yellow, erect when dry; cilia none or rudimentary. — Musc. Frond. ii. 102, t. 37; Bryol. Eur. t. 210. *O. saxatile*, Brid. Bryol. Univ. i. 275.

Hab. On limestone rocks; Niagara Falls; Salem, Mass.; Ontario, Canada; Rocky Mountains, etc.; rare. A doubtful form from the Washoe Mountains, Nevada (*Watson*), with thicker more papillose and more revolute leaves, closer areolation, and more pilose calyptra, is mentioned by James (Bot. King Exp. 402; Bot. Calif. ii. 383).

2. **O. lævigatum**, Zett. Like the last in size and aspect, differing in the very hairy calyptra, the capsule not striate and perfectly smooth when dry, the teeth very papillose and more closely articulate, with rudimentary cilia, and in the narrower basal cells of the leaves. — Schimp. Bryol. Eur. Suppl. t. 2; James, Bot. King Exp. 402.

Hab. Pah-Ute Mountains, Western Nevada (*Watson*).

3. **O. cupulatum**, Hoffm. Growing in more or less dense tufts, of a dirty green or brownish color: leaves close, spreading when moist, oblong-lanceolate, reflexed on the borders; cells very small toward the apex: calyptra campanulate, shorter and broader than in *O. anomalum*, slightly hairy, pale reddish brown: capsule half-emergent, globose-ovate, short-necked, 16-striate, the striæ more or less dark yellow and alternately short and longer, 16-costate and urceolate when dry and empty; lid pale yellow, deep orange at base, short, straight-beaked from its convex base; teeth 16, free to the base, pale yellow, spreading star-like when dry. — Deutschl. Fl. ii. 26; Bryol. Eur. t. 209.

Var. **minus**, Sulliv. Plants short, closely pulvinate, blackish green: leaves more distinctly revolute on the borders, somewhat narrower: capsule shorter. — Icon. Suppl. 61, t. 44. *O. Lescurii*, Aust., Musc. Appal. n. 163, and Bull. Torr. Club, vi. 341.

Var. **Peckii**, Sulliv. l. c. Capsule subovate, 8-striate: calyptra distinctly hairy. — *O. Peckii*, Aust., Musc. Appal. n. 162; Peck, Rep. N. Y. Univ. (1873), xxv. 71. *O. cupulatum* (?), Drumm. Musc. Amer. (Coll. II.) n. 81.

Var. **Porteri**, Sulliv. l. c. Capsule 8- (rarely 16-) striate, longer-pedicellate. — *O. Porteri*, Aust., ll. cc., n. 161, and vi. 341.

Var. **parvulum**, Sulliv. l. c. Plants of small size: leaves narrower: capsule 8-striate. — *O. parvulum*, Mitt. Journ. Linn. Soc. viii. 25. *O. Sturmii*, Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. n. 117, in part.

Hab. Dry rocks, in the middle districts; Ukiah, California (*Bolander*); the first variety on limestome rocks along the Ohio River (*Lesquereux*); the second in New York (*Peck*); the third in Pennsylvania (*Porter*); the last in New Mexico (*Wright*).

4. **O. Sturmii**, Hoppe & Hornsch. Tufts less compact, greenish black or brown: leaves open and recurved when moist, revolute on the whole margin, especially when dry, acutely carinate; upper areolation densely papillose, the basilar rectangular or vermicular, nodulose near the base, quadrate-equal at the angles: calyptra very hairy: capsule immersed, oval, short-necked, with 8 very obscure striæ, slightly constricted under the orifice when dry and empty, and there 8-costate, smooth in the middle; teeth pale-yellow, not as distinctly punctate as in the preceding, erect, slightly incurved when dry; cilia none or rudimentary. — Regensb. Flora (1819), ii. 89; Bryol. Eur. t. 209.

Hab. Rocks, Yosemite Valley (*Bolander*); Nevada (*Watson*).

5. **O. Texanum**, Sulliv. Plants large, loosely pulvinate, brown or blackish green: leaves loosely imbricate, erect-open when dry, spreading-recurved when moist, deeply carinate-costate or subplicate from the middle to the apex, linear-lanceolate; borders reflexed all around; upper areolation opaque, punctiform, slightly papillose; lower cells longer and oblong, pellucid: calyptra long, covering the capsule to the base, very hairy: capsule immersed on a short pedicel, oblong-obovate, short-necked, distinctly 8-costate its whole length when dry; lid with a short straight beak; teeth 8 and bigeminate, or 16 geminate and adjacent in pairs, whitish yellow; cilia 16, rudimentary and rarely seen. — Mosses of U. States, 33, and Icon. Musc. 53, t. 34; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 122 (excluding diagnosis).

Var. **globosum**, Lesq. Stems shorter: leaves erect when moist: capsule shorter, globose, emergent upon a somewhat longer pedicel, with a brown shining calyptra. — Mem. Calif. Acad. i. 17.

Hab. Texas (*Wright*); New Mexico (*Fendler*); on rocks, California (*Bolander*); Colorado (*Wolf & Rothrock*).

The species is much like *O. Sturmii*, but differs in the larger plants, with longer narrower more recurved and spreading leaves, a more hairy calyptra, a longer capsule prominently 8-ribbed throughout when dry, and an inner peristome, though more or less rudimentary.

6. **O. Douglasii,** Duby. Similar to *O. Texanum*, differing in the leaves distinctly revolute on the borders, the upper areolation prominently papillose, the calyptra more enlarged at base, the capsule exserted on a somewhat longer pedicel, the lid longer-rostrate, and in the shorter and broader teeth without traces of cilia. — Genèv. Soc. Phys. Mém. xix. 293, t. 1, fig. 2.

* * *Peristome double, the inner of* 8 *cilia: capsule ribbed when dry.*

7. **O. rupestre,** Schleich. Plants long, loosely cespitose, decumbent: leaves spreading, recurved when moist, strict, rigid and imbricate when dry, oblong-lanceolate, revolute or involute on the borders; upper areolation very small, scarcely distinct, the basilar narrowly rectangular, more or less vermicular near the costa, minutely papillose on both faces: calyptra campanulate, covered with yellow hairs: capsule emergent or subemergent, broadly ovate, decurrent into a short neck, faintly 8-striate, pale yellow when young, reddish brown when old, truncate when dry or slightly constricted in the middle, 8-ribbed in the upper part only; lid convex, short-beaked; teeth 16, in pairs, long, close, distantly punctate, often perforated along the dividing line, pale yellow, erect when dry; cilia stout, of a double series of cells, nearly as long as the teeth, yellowish. — Schwaegr. Suppl. i. 2. 27, t. 53; Bryol. Eur. t. 217.

Hab. On rocks, Yosemite Valley (*Bolander*); Nevada (*Watson*); Colorado (*Wolf & Rothrock*).

The species varies in its more or less loose or compact tufts, the stems short or elongated, and the calyptra more or less villous. It has the same appearance as *O. Sturmii* and *O. Texanum*, the characters of the peristome essentially separating the species.

8. **O. Bolanderi,** Sulliv. Plants shorter, cespitose, blackish green: leaves closely imbricate, recurved-spreading when moist, oblong-lanceolate, blunt at the apex; borders reflexed at the base only; upper areolation round, angular or square, bistromatic, slightly papillose, loose and elongated-oval toward the base: calyptra hairy: capsule half-emergent, oblong-oval, 8-costate under the orifice, short-pedicelled and obscurely

necked; lid rostellate; teeth 16, geminate, long-lanceolate, transversely densely punctulate, lineolate, reflexed when dry; cilia 8, robust, as long as the teeth, of a double row of punctate cells. — Icon. Musc. Suppl. 64, t. 46.

HAB. On rocks, California (*Bolander*).

Allied to the last, differing essentially in the teeth of the peristome, the longer capsule, the bistromatic cells of the leaves, etc.

9. **O. Watsoni,** James. Plants loosely cespitose, green, yellowish below; stem simple or rarely divided: leaves soft, open, reflexed when moist, lanceolate from the more enlarged erect base; borders revolute all around; upper areolation with long bifurcate papillæ: calyptra moderately hairy: capsule short-pedicellate, emergent, oval, without a neck, distinctly costate when dry, and constricted under the broad orifice; lid short-beaked; teeth smooth, distantly articulate, closely connate in pairs, yellowish white; cilia stout, of a double row of cells, punctate. — Bot. King Exp. 401; Sulliv. l. c. 73, t. 54.

HAB. Damp shaded rocks, West Humboldt Mountains, Nevada, at 5,500 feet altitude (*Watson*).

Allied to *O. Texanum*, differing in its color, in the broader, softer, more reflexed leaves, the long forked papillæ, the peristome, etc.

10. **O. affine,** Schrad. Tufts loose, dark green: leaves open or slightly recurved, lanceolate-acuminate, very papillose; borders reflexed all around: calyptra conical-mitrate, greenish, with few spare short hairs, covering nearly the whole sporangium: capsule of a thin tissue, emergent, narrowly oval, defluent into a collum nearly as long as the sporangium and covering the pedicel at its base, sulcate and elongated when dry, pale yellow, its striæ slightly darker-colored; lid convex, rostellate, pale yellow; teeth bigeminate, sometimes split along the divisural line, pale yellow; cilia 8, filiform, as long as the teeth. — Spic. Fl. Germ. 67; Bryol. Eur. t. 216.

HAB. Trunks of trees, Lake Superior (*Agassiz*).

The species is easily confounded with the following, though very distinct in its nearly naked calyptra, its smaller size, shorter pedicel, etc.

11. **O. alpestre,** Hornsch. Tufts compact, brownish green: leaves lanceolate, deeply carinate, revolute and minutely crenulate on the borders; upper areolation minutely punctate, papillose, loose, linear or equilateral, partly chlorophyllose at base: calyptra nearly smooth, covering three-fourths of the capsule, pale yellow, turning blackish at the apex: capsule

emergent, oval or slightly obovate, broadly striate, urceolate when empty and dry; teeth connate in pairs, perforated at the apex, punctate; cilia as long as the teeth. — Schimp. Coroll. 42; Bryol. Eur. t. 213.

Var. **majus.** More robust, glaucous green: leaves broader, reflexed on the borders; cells with longer simple or double papillæ: teeth longer, entire, minutely punctate. — *O. alpestre*, var., Sulliv. Icon. Musc. Suppl. 69, t. 51. *O. occidentale*, James, Bot. King Exp. 402.

Hab. Upper Canada, to the Rocky Mountains (*Drummond*); Utah, (*Watson*).

12. **O. speciosum,** Nees. Plants longer than in the last, yellowish green: leaves close, open, recurved when moist, densely verrucose, long-lanceolate, complicate in the upper part; borders revolute all around: calyptra large, campanulate, covering nearly the whole capsule, densely covered with yellow flexuous hairs: capsule thin, cylindrical-oblong, pale yellow, narrowed into a short collum and comparatively long-pedicelled, generally emergent, smooth when empty or merely narrowly costate near the orifice, obscurely 8-plicate when dry; teeth bigeminate, perforated at the apex; cilia generally 8, rarely 16, yellowish, densely papillose, more or less sinuous, composed of two rows of large cells. — Sturm, Deutsch. Fl. ii. 17; Bryol. Eur. t. 217. *O. elegans*, Schwaegr.; Richards. Frankl. Narr. App. 28; Mitten, Journ. Linn. Soc. viii. 24.

Var. **polycarpum.** Stem-leaves very short, erect, appressed, dark green, most of them with male flowers in the axils; comal leaves longer: calyptra dark brown, deeply plicate, slightly hairy.

Var. **Raui.** Stems shorter: capsule exserted on a longer pedicel; teeth pellucid, distinctly articulate; cilia longer (always ?) than the teeth. — *O. Rauei*, Austin, Bull. Torr. Club, vi. 343.

Hab. Trunks of trees; plains and mountains. Widely distributed and extremely variable; the varieties in the mountains of Colorado (*Hall, Brandegee*).

O. elegans, Schwaegr., is one of the numerous varieties of this species, differing from the normal form in the smooth capsule and the stems more slender and shorter. *O. Hainesiæ*, Aust. l. c. 342, is another form of it, differing merely in the short and less numerous hairs of the capsule. The specimens were collected on rocks in Colorado by *Mrs. Mary P. Haines*. We have seen no specimens of var. *Raui*.

13. **O. Hallii,** Sulliv. & Lesq. Plants small, loosely cespitose; stems simple, divided by basilar innovations: leaves spreading, linear-lanceolate, blunt at the apex; borders revolute from the base to the middle; upper areolation dense, with round papillose cells; perichætial leaves similar: calyptra large, slightly hairy, covering the capsule to its base: capsule subimmersed, oval, on a short thick pedicel entirely covered by the tube of the vaginule, distinctly 8-costate when dry and slightly contracted under the orifice; lid conical, apiculate; teeth whitish, in pairs, vermiculose; cilia shorter, slender, fugacious. — Sulliv. Icon. Musc. Suppl. 63, t. 45.

HAB. On trees; Rocky Mountains (*E. Hall*).

14. **C. sordidum,** Sulliv. & Lesq. Plants short, loosely cespitose, brownish green: leaves close, spreading, the upper open, erect, lingulate-lanceolate, gradually narrowed to the apex, reflexed or revolute on the borders, irregularly quadrate-areolate and papillose in the upper part; basilar cells quadrangular, longer and linear near the costa: calyptra slightly villous: capsule immersed, obovate, defluent from a slightly inflated short collum to a short pedicel, plicate-costate when dry, enlarged at the orifice; lid convex, short-beaked; teeth bigeminate, broadly perforate from the middle upward along the dividing line; cilia 8, smooth, nearly as long as the teeth, of a double row of cells, enlarged at base. — Aust. Musc. Appal. n. 168; Sulliv. Icon. Musc. Suppl. 67, t. 49.

HAB. On trees, generally in wooded swamps; Massachusetts (*Lesquereux, James*); New York (*Austin*).

15. **O. Kingianum,** Lesq. With the aspect of *O. lævigatum*, from which it differs in the leaves merely reflexed on the borders, not revolute, with the basal areolation longer and narrower, the calyptra with thin scattered hairs, the capsule scarcely emergent on a shorter pedicel, longer, cylindrical when empty, the peristome double, the inner of 8 stout cilia, composed of a double series of cells. — Mem. Calif. Acad. i. 18; Sulliv. Icon. Musc. Suppl. 74, t. 55.

HAB. On rocks, near the Falls of the Yosemite (*Bolander*).

* * * *Plants small, one c.m. long, or less.*

16. **O. Ohioense,** Sulliv. & Lesq. Plants more or less widely cespitose, yellowish green above, dirty brown within;

stems about one c.m. long, branching by innovations: leaves close, spreading when moist, oblong at base, lanceolate, blunt at the apex, revolute on the borders, smooth on both faces; areolation distinct, the upper cells small, round, the lower larger, quadrangular near the border, gradually longer toward the costa: calyptra more or less hairy: capsule oblong-ovate, very shortly pedicellate, immersed, slightly inflated at the collum, defluent into the vaginule, pale yellow, pyriform-campanulate and distinctly 8-striate when dry and empty; teeth 8, bigeminate, thickly punctulate; articulations distant, 5 to 7; cilia shorter than the teeth, of a double row of cells. — Musc. Am.-Bor. Exsicc., ed. 2, n. 181; Sulliv. Icon. Musc. Suppl. 66, t. 48. *O. Canadense*, Sulliv. & Lesq. Musc. Bor.-Am. n. 121; Sulliv. Mosses of U. States, 34.

Var. **citrinum.** Leaves dark green, narrower: capsule thin, yellow. — *O. citrinum*, Aust., Musc. Appal. n. 170.

Hab. On trees; Ohio and Middle States, common.

Resembles the two following species, but it is a little larger and easily known by the straw-colored capsule not constricted under the orifice, the whitish calyptra, and the dirty reddish teeth.

O. Canadense, Bruch & Schimp. (Lond. Journ. Bot. ii. 667), based on Drumm. Musc. Amer. n. 149 and 151, is not recognizable among the specimens in our sets of Drummond's mosses, and remains a doubtful species. It is characterized as differing from *O. patens* in its smaller capsules, longer pedicels, and rusty red-colored teeth.

17. **O. fallax,** Schimp. Plants very small: leaves oblong to above the middle, lanceolate to a sharply acute point; cells of the upper areolation round, inflated, the basilar broadly rectangular, sinuous; perichætial leaves shorter: calyptra nearly naked, broadly campanulate: capsule immersed, subglobose with a short neck, abruptly enlarged from the base and truncate-oblong when dry, marked with 8 orange-colored striæ; teeth 8, bigeminate, not easily separating, yellowish, reflexed when dry; cilia 8, short, whitish yellow, of simple cells or of a double row of cells near the base only. — Syn. 264. *O. pumilum*, Schwaegr. Suppl. i. 2. 22, t. 50, in part (figs. 6, 11); Bryol. Eur. t. 211.

Var. **truncatulum,** Aust. Capsule narrower, oblong, cylindrical when dry; cilia as long as the teeth. — Bull. Torr. Club, vi. 344.

Hab. The variety at the base of old buildings, Illinois (*Hall*); rare.

18. **O. brachytrichum,** Schimp. Plants short, about one c.m. long, in pale green tufts, blackish and streaked with yellow when old: leaves oblong-lanceolate, the upper longer, linear-apiculate, acutely carinate, subrevolute or reflexed on the borders: male flowers terminal on separate branches: calyptra pale straw-color, bearing a few short hairs at the apex: capsule thin, oblong, subcylindrical in connection with a somewhat long collum, light brown passing to yellow, with 8 dark-colored striæ, ribbed when dry; teeth 8, small, bigeminate, entire, with large punctulate areoles; cilia 8, smooth, as long as the teeth. — Lesq. & James, Proc. Am. Acad. xiv. 140. *O. obtusifolium*, Drumm. Musc. Amer. n. 157.

Hab. On trees; Upper Canada to the Rocky Mountains (*Drummond*).

19. **O. strangulatum,** Beauv. Plants very small, in small loose dirty green tufts, half a c.m. long: leaves half-spreading when moist, linear-lanceolate from an oblong base, angularly pointed or blunt at the apex, revolute on the borders; upper areolation round, small, close, slightly papillose, long and quadrangular toward the base; perichætial leaves longer, erect, somewhat sheathing: calyptra nearly naked: capsule short-pedicelled, half-emergent, oblong-obovate, distinctly 8-costate when dry, strongly constricted under the orifice, dirty brown when old; lid conical, obtusely apiculate; teeth 8, bigeminate, dirty yellow, granulose, reflexed when dry; cilia strong, as long as the teeth, formed of a double row of cells. — Prod. 81; Schwaegr. Suppl. ii. 2. 33, t. 54; Sulliv. Musc. Allegh. n. 128, Mosses of U. States, 33, and Icon. Musc. 57, t. 36.

Hab. On trees, rarely on rocks; very common.

* * * * *Capsule exserted, long-cylindrical when dry.*

20. **O. tenellum,** Bruch. Plants very small, tufted: lower leaves broadly lanceolate, the upper longer-lanceolate, revolute on the borders, acute or blunt; areolation large, not papillose: calyptra long and narrow, yellowish green, rarely pilose: capsule emergent, oblong-cylindrical, decurrent to a long collum covering the whole length of the pedicel, broadly reddish-striate, broadly costate and constricted under the orifice when dry and empty; lid short; peristome short, the teeth bigeminate, bifid at the apex, pale; cilia a little shorter, of a double series of cells. — Brid. Bryol. Univ. i. 786; Bryol. Eur. t. 212.

HAB. On trees, at the base of the Rocky Mountains (*E. Hall, Wolf & Rothrock*).

21. **O. consimile,** Mitt. Plants very small, in loose yellowish green tufts: leaves open, recurved when moist, soft, oblong at base, gradually narrowly lanceolate, with borders revolute all around, obscurely papillose; cells rectangular, nearly diaphanous toward the base, round and small in the upper part: calyptra with few hairs: capsule without collum, oval, exserted upon a pedicel longer than the capsule, marked with 8 yellow striæ, narrow, sublinear, enlarged at the orifice or urceolate and 8-plicate when dry; lid red-margined, convex-apiculate; teeth 16, joined in pairs at the base, with 7 or 8 articulations, pale yellow, minutely papillose on both faces; cilia 8, as long as the teeth, enlarged at base, smooth. — Journ. Linn. Soc. viii. 24; Sulliv. Icon. Musc. Suppl. 59, t. 43.

HAB. Vancouver Island (*Lyall*).

Allied to *O. pulchellum*, differing especially in the shorter and broader capsule, the teeth papillose, not vermiculate, the cilia only 8, entirely smooth, and the leaves uniformly papillose. From *O. cylindrocarpum* it is distinguished by its shorter capsule and somewhat longer pedicel, and by the soft longer taper-pointed leaves.

22. **O. cylindrocarpum,** Lesq. Plants short, slender, loosely pulvinate, dark green: leaves appressed when dry, erect when moist, long-lanceolate from the enlarged base, blunt-pointed; borders revolute to near the apex; upper areolation in dense ovate-quadrate minutely papillose cells, basal loose, oblong and quadrate: calyptra large, more or less hairy, covering the capsule to near the base: capsule long-pedicelled, cylindrical or narrowly oval, pale green or yellowish, 8-striate, narrowly 8-costate when empty; lid conical-apiculate; teeth 16, close, in pairs, granulose; cilia 8, stout, of a double series of cells, nearly as long as the teeth. — Trans. Amer. Phil. Soc. xiii. 6, and Proc. Calif. Acad. i. 17; Sulliv. Icon. Musc. Suppl. 70, t. 52.

HAB. Rocks and trees, Oakland and Dardanelles Cañon (*Bolander*).

O. Coulteri, Mitten (Journ. Linn. Soc. viii. 25), differing in the leaves a little more distinctly papillose, the calyptra covered with short appressed hairs, and the cilia shorter than the teeth, is evidently a mere variety. As shown in Sullivant's figure, the hairs of the calyptra are always appressed, and the cilia slightly shorter than the teeth, though sometimes as long. This form was sent from California by *Coulter*.

23. **O. psilocarpum,** James. Plants minute, cespitulose, blackish green; stems about 5 m.m. long: lower leaves gradu-

ally longer from the base upward, oblong-lanceolate, apiculate at the blunt apex, the borders revolute; areolation comparatively loose, the upper cells round, granulose and minutely papillose, the lower quadrate near the borders, quadrangular-oblong near the costa: calyptra large, naked: capsule subimmersed, broadly oval or globose, cylindrical-oblong when empty, thin, with a thin whitish epicarp, not striate nor plicate; lid plano-convex, obtuse; teeth 16, geminate, granulose; cilia 8, short, very slender. — Trans. Amer. Phil. Soc. xiii. 110; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc., ed. 2, n. 180; Sulliv. Icon. Musc. Suppl. 68, t. 50. *O. pusillum*, Mitt. Journ. Linn. Soc. viii. 25?

HAB. Pennsylvania, on poplars, and Massachusetts (*James*); South Carolina (*Ravenel*). Early spring.

A very fine distinct species. *O. pusillum*, Mitt., is described as having the capsule 8-plicate when dry. This does not agree with the characters of *O. psilocarpum*, but specimens communicated by the author do not differ. Specimens of *O. psilocarpum*, with a description, were distributed by James as early as 1858.

24. **O. exiguum,** Sulliv. Plants extremely small, in loose dark green tufts; stems five m.m. long, simple or fastigiate-branching: leaves linear-oblong, obtusely acuminate, open, erect, slightly recurved on the borders, punctiform-areolate and minutely papillose in the upper part; basilar cells loose, quadrangular or quadrate-oblong: flowers dicœcious; male plants gemmiform, terminal in smaller plants than the fertile: calyptra naked, or rarely with a few appressed hairs: capsule subimmersed, oblong-oval, broadly and obscurely costate, truncate at the broad orifice; lid hemispherical-apiculate; peristome double, the outer of 16 geminate teeth, the inner of 8 lanceolate cilia, broader than the teeth, white, punctulate, composed of a double series of cells. — Mosses of U. States, 33, and Icon. Musc. 55, t. 35.

HAB. Base of trees, Santee Canal, South Carolina (*Ravenel*).

* * * * * *Outer peristome of* 16 *teeth, the inner of* 8 *or* 16 *cilia; capsule not ribbed, smooth when dry: plants large: flowers monœcious.*

25. **O. leiocarpum,** Bruch & Schimp. Plants of medium size, loosely fasciculate, cespitose: leaves open, recurved when moist, ovate at base, long-lanceolate above, the borders revolute, and surface papillose: calyptra campanulate, with few hairs: capsule short-pedicellate, immersed, its collum defluent

to the short-naked vaginule, ovate, soft, pale yellow, smooth when empty and slightly contracted under the orifice; teeth linear, separating along the dividing line or bifid, revolute when dry; cilia 16, deeply erose, punctulate, yellow. — Bryol. Eur. t. 220. *O. striatum*, Hedw. Musc. Frond. ii. 99, t. 36, in part (fig. 9). *O. Rogeri*, Sulliv. Mosses of U. States, 33.

HAB. On trees in the woods. Upper Canada (*Drummond*); Lake Superior (*Agassiz*). Very rare in America.

26. **O. pallens,** Bruch. Plants in soft pale green tufts: leaves soft, oblong and long-lanceolate, blunt or acuminate, the borders revolute in the middle, slightly recurved at the base and apex; areolation papillose: calyptra conical-campanulate, pale, naked: capsule oblong, with a collum as long as the sporangium, yellowish, broadly darker-striate; cilia 16, sometimes 8, yellowish, very thin, as long as the dark yellow teeth. — Brid. Bryol. Univ. i. 788; Bryol. Eur. t. 218. *O. Rogeri*, Brid.; Schwaegr. Suppl. i. 2. 16, t. 53; Bryol. Eur. t. 212, and Suppl. t. 8.

HAB. Rock River, British Columbia (*Lyall*).

This species is quoted by Mitten (Journ. Linn. Soc. viii. 23), but we have seen no American specimens.

* * * * * * *Capsule ribbed: plants small.*

27. **O. pulchellum,** Brunton. Plants in small loose irregular tufts, pale green: leaves open, flexuous when moist, curved or slightly crispate when dry, soft, linear-lanceolate from a slightly enlarged ovate base, acuminate; borders reflexed in the lower part, plane above; areolation very minutely punctiform and papillose in the upper part, loose, pale and smooth toward the base: calyptra campanulate, naked, pale yellow, brownish at apex: capsule small, oblong, short-necked, thin, yellowish, exserted on a somewhat long pedicel, twisted to the left when dry, cylindrical, somewhat costate and constricted under the brown orifice when old; teeth long, approximate in pairs, reflexed when dry, dark orange; cilia 16, composed of a single series of cells here and there appendiculate, ferruginous. — Smith, Engl. Bot. t. 1787; Bryol. Eur. t. 223.

Var. **longipes,** Sulliv. Pedicel a little longer: teeth and cilia generally 16.

HAB. Oregon (*Hall*); Coal Harbor, Alaska (*Harrington*).

O. Columbicum, Mitten (Journ. Linn. Soc. viii. 24), is according to Sullivant's note in his herbarium a variety with shorter perichætial

leaves, the male flowers on short terminal branches, the capsule subexserted on a short pedicel, and the teeth and cilia 8.

28. **O. diaphanum,** Schrad. Plants small, soft, in irregular loose often scattered bright green tufts: leaves erect, oblong-lanceolate, narrowed into a lanceolate serrate hyaline point, borders reflexed: calyptra thin, naked or with a few hairs: capsule immersed, thin, oblong, short-necked, pale yellow, obsoletely striate and nearly smooth when dry; teeth equidistant, linear-lanceolate, pale yellow, reflexed when dry; cilia 16, filiform, of a simple row of cells. — Spicil. Fl. Germ. 69; Bryol. Eur. t. 219.

Hab. San Marcos, Texas (*Wright*).

29. **O. canum,** Mitten. Much like the last, differing in the shorter fragile hyaline point of the leaves, the longer calyptra beset with short hairs and covering nearly the whole capsule, the capsule emergent, the teeth bigeminate, and the cilia composed of a double row of cells. The author remarks that in appearance it is like *O. pumilum.* — Journ. Linn. Soc. viii. 26.

Hab. British America (*Drummond*); San Marcos, Texas (*Wright*)?

We have not found in Drummond's mosses any specimen representing this species. A note in Sullivant's herbarium states "that the parcel with Wright's specimens has two forms, one referable by its foliage to *O. diaphanum*, the other appears to be *O. canum*, Mitten." This observation is confirmed by dissection, except that the calyptra of this supposed *O. canum* is without hairs.

* * * * * * * *Leaves obtuse.*

30. **O. rivulare,** Turn. Monœcious: plants long, prostrate, pendent, often floating, naked and simple below, fasciculately ramose and densely foliate in the upper part, blackish: lower leaves distant, ovate-lanceolate, the upper close, lingulate, obtuse, smooth and revolute on the borders; upper areolation punctiform, the lower narrowly rectangular: calyptra campanulate, entirely naked, blackish: capsule short-pedicellate, ovate, its collum shorter than the sporangium, yellow, with darker striæ, slightly contracted below the apex and costate its whole length when dry; cilia 8, somewhat longer, and 8 shorter than the orange teeth, hyaline, curving upward. — Musc. Hib. 96, t. 8; Bryol. Eur. t. 219.

Hab. On roots of trees and posts in water, Anderson Valley, California, common (*Bolander*); Oregon (*Hall*); etc.

31. **O. obtusifolium,** Schrad. Dicœcious: plants small, irregularly pulvinate, pale green or yellowish above, brown below: leaves half-spreading from the middle when moist, imbricate when dry, oval, oblong-obtuse and slightly serrulate at the hyaline apex, concave, papillose on the back; perichætial leaves smaller, sheathing: calyptra covering the capsule to the middle, not hairy, but rough and darker-colored at the apex: capsule on a very short pedicel, immersed, oval, with a long defluent collum, yellowish, with 8 darker striæ, furrowed its whole length when dry; lid conical, acuminate; teeth 8, bigeminate, reflexed when dry, vermiculose, papillose on the outside, pale orange color; cilia 8, yellow, nearly as broad as the teeth, of two series of cells. — Swartz, Musc. Suec. 90, t. 4; Bryol. Eur. t. 208. *O. Rogeri* (?), Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. ed. 2, n. 174.

HAB. British America (*Drummond*); on poplar trees near Elba, in the Adirondacks (*Lesquereux*); Pennsylvania (*James*); Ontario (*Macoun*).

32. **O. Jamesianum,** Sulliv. Monœcious: plants small, loosely pulvinate, pale green when moist: leaves oblong or oblong-lanceolate, obtuse, revolute on the borders, strongly papillose: calyptra with some hairs: capsule immersed, pyriform, short-pedicellate and short-necked, 8-costate when dry and constricted under the broad orifice; peristome simple, of 16 distinct teeth, vermiculate transversely below the middle and lengthwise above. — James, Bot. King Exp. 401; Sulliv. Icon. Musc. Suppl. 71, t. 53.

HAB. On limestone rocks, East Humboldt Mountains, Nevada (*Watson*); Fort St. James, British Columbia (*Macoun*).

A very distinct species, easily distinguished from the preceding by the long papillæ on the surface of the leaves, the pyriform capsule, the inflorescence, simple peristome, etc.

* * * * * * * * *Peristome double, the inner of* 16 *free cilia.*

33. **O. Lyellii,** Hook. & Tayl. Dicœcious: plants of wide growth, loosely cespitose or pulvinate, green: leaves long, linear-lanceolate from the oblong base, sharply acuminate, flexuous, squarrose when moist, somewhat twisted when dry, plane on the borders, papillose and beset on the surface with clavate brown densely articulate filaments: male plants smaller: calyptra pilose, large, covering the whole capsule: capsule emergent, ovate, its collum as long as the sporangium, striate, yellowish brown, much elongated and deeply sulcate when dry

and empty; teeth recurved when dry; cilia broad, reddish, as long as the teeth, slightly erose on the pellucid borders. — Musc. Brit. 76, t. 22; Bryol. Eur. t. 221; Wilson, Eng. Bot. t. 2834.

Var. **papillosum.** Leaves more highly papillose. — *O. papillosum*, Hampe, Linnæa, xxx. 458.

Hab. On trees in California, and on the western slope of North America, common. The variety is scarcely worthy of notice, as the papillæ vary in prominence, even on the same specimens.

57. MACROMITRIUM, Brid. (Pl. 2.)

Calyptra campanulate-plicate, more or less deeply laciniate at base. Peristome none, or simple, or double; the outer of 16 teeth, lanceolate, free or geminate, granulose, whitish or reddish brown; the inner formed of a more or less enlarged membrane, truncate or split into teeth similar to the outer ones: annulus none or simple, rarely present.

1. **M. Sullivantii,** Muell. Plants acrocarpous, becoming pleurocarpous by innovations, entangled and loosely cespitose, in wide decumbent creeping or pendent tufts, reddish brown and rigid: leaves crowded, open, erect when moist, closely imbricate when dry, lanceolate from the narrowed decurrent base, gradually acuminate, deeply excavate in the middle of the base, carinate, costate to near the apex, slightly recurved on the borders; areolation nearly round, dense, slightly papillose: flowers monœcious, the male in axillary or terminal buds; outer perigonial leaves ovate, the inner obovate, apiculate, hyaline, erose-dentate from the middle upwards: calyptra hairy, covering the whole capsule: capsule oval-cylindrical, plicate at the base and under the orifice when dry, emergent on a slender pedicel, about one c.m. long; lid conical, subulate; peristome almost none, the outer imperfect, the inner a short truncate membrane. — Bot. Zeit. xx. 361. *M. Dregei*, Sulliv. Mosses of U. States, 31, and Icon. Musc. 59, t. 37; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. n. 128.

Hab. On the bark of old pine trees, top of Jonah or Bear Mountain, Georgia (*Lesquereux*).

2. **M. Fitzgeraldi.** In its dark brown color, its short yellowish branches sparingly fruiting, and also in the very hairy

calyptra and the absence of a peristome, this species closely resembles the last. It differs in the larger distinctly ribbed capsule, the leaves longer and not as deeply concave in the middle near the base, the shorter conical blunt lid, and the shorter pedicel covered to its middle by the exserted vaginule having its orifice fringed by long paraphyses as in *M. lycopodioides*, Schwaegr. The plant also appears to be diœcious, as no male flowers could be found upon the specimens.

HAB. On trees, Florida (*C. H. Fitzgerald*).

3. **M. rhabdocarpum**, Mitt. Monœcious: stem creeping, inordinately branching, loosely cespitose: leaves crispate when dry, spreading-open and slightly flexuose when moist, linear-lanceolate, acute or obtuse and subapiculate, flat on the minutely crenulate borders, carinate by the percurrent yellowish costa; basilar cells oblong, the upper round, papillose; perichætial leaves erect, lanceolate, narrower and more acute at the apex: calyptra slightly hairy, straw-color, covering the capsule to the base: capsule oval, gradually narrowed to the petiole and to the orifice, distinctly plicate; lid subulate; peristome simple, the teeth short, pale and fragile. — Journ. Linn. Soc. xii. 199; Austin, Coult. Bot. Gaz. ii. 110.

HAB. St. Augustine, Florida (*J. Donnell Smith*).

4. **M. mucronifolium**, Hook. & Grev. Monœcious: stems creeping, with short crowded branches: leaves open-spreading, linear-lanceolate, rounded in narrowing to a recurved acumen, carinate by the thick costa, entire, convex, rugulose lengthwise; upper cells minute, round, obscure, the lower a little elongated on the borders: calyptra narrowly conical, covering the capsule to the base: capsule shortly pedicelled, urceolate, the orifice naked. — Brewst. Edin. Journ. i. 116, t. 4; Mitt. Journ. Linn. Soc. xii. 202.

HAB. Trunks of palms, St. Johns River, Florida (*C. H. Fitzgerald*).

58. SCHLOTHEIMIA, Brid. (Pl. 2.)

Differs from *Macromitrium* in the campanulate calyptra, not plicate, and constricted at base by the involute segments, and in the teeth of the outer peristome 16, spirally revolute, marked by a longitudinal black line, generally very rugose, fleshy, the inner more or less perfect, often rudimentary, from a pale

colored membrane. Capsule exannulate. Lid cupuliform, subulate, thin.

1. **S. Sullivantii,** Muell. Plants in dense widely expanded depressed yellowish green tufts; primary stems creeping, densely ramose: branches very short, erect, fasciculate-ramose, closely joined together by a thick felt of brown radicles: leaves very close, recurved-spreading, lingulate, short-mucronate by the excurrent thick costa, ventricose and a little plicate at base; surface undulate-wrinkled toward the apex; cells round-hexagonal, minute, in transverse rows, the basilar loose, oblong: flowers monœcious, the male lateral, in open short pedicellate buds: calyptra covering the whole capsule, scabrous at the apex, 5–6-lobate at base, the lobes incurved and connivent: capsule cylindrical-oblong, gradually narrowed up to the orifice, emergent on a pedicel about a half c.m. long; teeth 16, linear, with hyaline articulations; cilia 16, orange color, punctulate, striolate; basilar membrane none or scarcely visible. — Syn. i. 756; Sulliv. Mosses of U. States, 35, t. 2, and Icon. Musc. 61, t. 38. *S. rugifolia,* Hook. & Wils. in Drumm. Musc. Am. (Col. II.), n. 85.

Hab. Bark of trees in the Southern States; not rare.

59. ENCALYPTA, Schreb. (Pl. 2.)

Plants loosely cespitose. Leaves large, lingulate or spatulate; cells of the areolation thick, chlorophyllose, covered in the upper part of the leaves with large divided papillæ, loose, rectangular, sometimes reddish brown in the lower part. Flowers monœcious or dicœcious, terminal. Vaginule cylindrical, capped by a conical membrane. Calyptra very large, cylindrical, campanulate. Capsule emergent on a solid pedicel, erect, regular, ribbed or twisted when dry. Peristome none, or simple, or double, very variable. Spores generally large, verruculose. — *Leersia,* Hedw.; Lindb. Syst.

* *Peristome none.*

1 **E. commutata,** Nees & Hornsch. Stems about one c.m. long: leaves ovate-lanceolate, acuminate, the upper longer-cuspidate by the excurrent costa, slightly transversely plicate in the middle; basilar cells narrowly oblong, yellowish: male

flowers terminal, on short lateral branches: calyptra long, descending far below the base of the capsule, reddish brown or chestnut color when old, irregularly laciniate at the base: capsule cylindrical-ovate, erect or slightly arched, its orifice half-covered by a thin horizontal membrane; annulus simple, narrow. — Bryol. Germ. ii. 46, t. 15; Bryol. Eur. t. 198. *E. lacera*, DeNot.; Muell. Syn. i. 514.

HAB. Fissures of rocks in alpine localities; Rocky Mountains (*Drummond*); Colorado (*Downie, E. Hall*); Nevada (*Watson*); British America and Alaska (*Macoun, Rothrock*), etc.

* * *Peristome of* 16 *more or less perfect teeth or none in the same species.*

2. **E. vulgaris,** Hedw. Leaves lingulate, apiculate, twisting when dry; costa reddish, percurrent or vanishing below the apex; areolation rectangular at base, very thin toward the middle, narrower and yellowish on the borders: calyptra covering the whole capsule, yellowish green, thin: capsule thin, cylindrical-ovate, exactly cylindrical when dry, obscurely or minutely wrinkled lengthwise, pale yellow, the borders of the orifice orange; peristome generally none, composed when present of 16 lineate pale fugacious often truncate teeth. — Spec. Musc. 60; Bryol. Eur. t. 199.

Var. **obtusa,** Schimp. Leaves obtuse. — Syn. 286.

Var. **pilifera,** Schimp. Stems shorter: leaves narrower; costa reddish, excurrent into a pale yellow hair.

Var. **elongata,** Schimp. Plants robust and much longer, in dense tufts: leaves broader.

HAB. Fissures of walls and rocks; alpine regions of New England, Rocky Mountains, California, Oregon, and Alaska; rare in America.

3. **E. rhabdocarpa,** Schwaegr. With the habit of the last: leaves oblong, lanceolate above, nearly plane or slightly concave; costa reddish-yellow, vanishing at the apex or passing up into a more or less elongated yellowish hair-point: calyptra descending below the base of the capsule: capsule shorter, narrowly ovate or cylindrical-oblong, reddish, with longitudinal brown striæ, deeply and regularly furrowed when dry; teeth lanceolate, distantly articulate, entire or here and there irregularly perforated, blood-red, rarely pale or absent; annulus simple, narrow. — Suppl. i. 56, t. 16; Bryol. Eur. t. 203.

HAB. Alpine and subalpine regions, in fissures of rocks; Colorado (*Downie*); Nevada (*Watson*); British America and Alaska.

4. **E. ciliata,** Hedw. In loose bright or pale green tufts: leaves soft, complicate-incurved when dry, undulate on the borders; costa pale yellow, vanishing below the apiculate apex or passing into it; basilar areolation loose, reddish above: calyptra straw-color, descending far below the base of the capsule, bordered at base by lanceolate solid whitish or orange laciniæ: capsule cylindrical, smooth, slightly constricted under the orifice when dry; peristome rarely absent, attached below the orifice, formed of 16 narrowly lanceolate teeth, sometimes divided into two irregular segments, spreading when dry; annulus none. — Spec. Musc. 61; Bryol. Eur. t. 200.

HAB. Shaded rocks and soil, in mountain regions of New England, the Rocky Mountains, and the Pacific slope; not rare.

* * * *Peristome simple, regular.*

5. **E. Macounii,** Aust. Differs from *E. apophysata*, Nees & Hornsch., in the leaves muticous at the apex, the costa vanishing below it, the calyptra fimbriate at base, the capsule (not mature) more distinctly apophysate, and the teeth shorter and much narrower. — Coult. Bot. Gaz. ii. 97.

HAB. Stewart's Lake Mountains, Canada (*Macoun*).

To this diagnosis, which, considering the immature state of the capsule, shows an essential difference from the European *E. apophysata*, the author adds: "calyptra about as large as in the largest specimens of *E. ciliata*, light fuscous yellow (the fringe brown, uniform, narrow, and delicate), densely papillose over the whole surface; pedicel reddish, minutely papillose, rather densely so above the middle, more remotely so below it, slightly twisted to the right in drying; apophysis at the base of the capsule very large; peristome single, the teeth of medium length, very narrow and filiform, red, more or less split into two equal segments, nodulose and granulose; leaves much crisped when dry, straight and erect when moist, narrowly lingulate, carinate, broadly revolute on the margin, very opaque, the costa ceasing below the apex and densely papillose on the back; perichætial leaves much smaller and thinner, the innermost scarcely exceeding the vaginule, with a broad subvaginal base and a lingulate very obtuse apex."

* * * * *Capsule striate, twisted to the left; peristome double.*

6. **E. procera,** Bruch. Plants densely tufted, long and robust: leaves lingulate, muticous or apiculate, the strong costa ceasing below the apex or rarely passing above it; basilar areolation reddish, hyaline, separated from the upper by a red zone: calyptra descending below the capsule, fimbriate only when young, straw-color: capsule ovate, cylindrical, pale yellow,

8-striate, twisted to the left and narrower when dry, its long purple pedicel generally twisted to the right or to the left just under the capsule; teeth of the outer peristome 16, long, linear, marked by a dividing line, distantly articulate, purple; inner peristome of 16 cilia, opposite and similar to the teeth, yellowish, very papillose, attached to a broad yellow membrane protruding into 16 short reddish cilia between the teeth, sometimes bifid at base and connivent into a cone when dry; annulus double. — Bruch & Schimp., Bryol. Eur. t. 205. *E. longipes*, Mitt. Journ. Linn. Soc. viii. 29, t. 5.

Hab. Shady ravines, British America (*Drummond*, *Macoun*).

Upon examination of the specimens of *E. longipes*, Mitt., in all of Drummond's sets, the characters have been found identical with those of *E. procera:* the plants monœcious; calyptra papillose, its borders emarginate, erose or fimbriate at base; perichætial leaves piliferous; capsule spirally striate, etc. The differences that appear in the characters indicated by Mitten result from the unripeness of the specimen he had for examination.

7. **E. Selwyni,** Aust. Differs from the preceding species especially in its smaller size, the leaves more or less revolute, the upper ones broadly lingulate with a long hyaline hair-point formed by the excurrent costa, which is densely papillose and reddish downward, and in the minutely and remotely papillose calyptra descending much below the base of the capsule, deeply laciniate and brown at the persisting base: capsule solid, strongly sulcate and distinctly twisted to the right, cylindrical; peristome glabrous, long, the outer teeth dark red, filiform, distantly nodulose, the inner yellow, with the cilia nearly as long as the teeth and arising from a broad membrane. — Coult. Bot. Gaz. ii. 109.

Hab. Vancouver Island (*Macoun*).

Intermediate between *E. procera* and *E. streptocarpa.*

8. **E. streptocarpa,** Hedw. Dicœcious: plants robust and of large size: leaves oblong-lingulate, muticous; costa reddish, ascending to the apex; perichætial leaves oblong at base, abruptly narrowed into a long lanceolate point: calyptra very long, prolonged much below the base of the capsule, dirty brown: capsule long and long-pedicellate, cylindrical, twisted to the left, orange-striate, spirally furrowed when dry; teeth filiform, separated to the base, minutely papillose, purple, erect; cilia numerous, irregular, more or less connate, half as long as

the teeth, adhering to the middle to a broad punctulate membrane. — Spec. Musc. 62, t. 10; Bryol. Eur. t. 204.

Hab. British America (*Drummond*); Alleghany Mountains (*Sullivant*); Lancaster Co., Pennsylvania (*Porter*); New Jersey (*Rau*); California (*Lapham*). Not yet found fruiting in America.

60. CALYMPERES, Swartz.

Plants small, sparingly branched. Leaves soft. Calyptra twisted, persistent, plicate, constricted at base and enclosing the capsule. Capsule erect and exserted. Peristome none.

1. **C. Richardi,** Muell. Dicœcious: plants loosely cespitose; stems short and slender, nearly simple: leaves spreading when moist, oblong, obtuse, very entire, with a strong costa vanishing at the apex but often enlarged, thick and covered with articulate filaments at its point: calyptra yellow, slightly scabrous at the apex: capsule short-pedicellate, oval; lid short, straight, conical, subulate. — Syn. i. 524.

Var. **Donnellii.** Leaves longer and narrower, flexuous and erect or open, spreading when dry. — *C. Donnellii*, Aust., Coult. Bot. Gaz. iv. 151. *C. Richardi*, Aust. Musc. Appal. Suppl. n. 489.

Hab. On trunks. Florida (*Garber, Austin, J. Donnell Smith*); the variety from the same locality (*J. Donnell Smith*).

2. **C. disciforme,** Muell. Plants subcespitose, rigid, nearly simple, dirty green: leaves rigid, open, spreading when moist, the lower large, oblong, more or less convolute, mucronate by the excurrent costa, the upper broadly ovate, acute with a thick percurrent costa, bearing in the middle a dense cluster of articulate and fasciculate filaments; upper areolation minute and minutely papillose, the basilar large, quadrate, hyaline at the margin: calyptra very scabrous upon the folds and at the apex: capsule short-pedicellate, oval; lid conical, oblique. — Linnæa, xxi. 183, and Syn. i. 525.

Hab. Caloosa, Florida (*Austin*).

3. **C. (?) crispum,** Aust. Plants short, in compact tufts, brown inside, yellowish green at the surface: leaves strongly crispate when dry, strict and suberect when moist, thin at the narrowed base, narrowly panduriform, lingulate, flat, papillose, retuse or obtuse at the apex, hyaline-margined and loosely quadrate-areolate in the lower part, very densely granulose-

areolate and papillose-crenulate in the upper, carinate by the yellowish percurrent costa. — Coult. Bot. Gaz. iv. 151. *Syrrhopodon* (?) *crispus*, Aust. l. c. ii. 109.

HAB. Jacksonville, Florida (*J. Donnell Smith*).

61. SYRRHOPODON, Schwaegr. (Pl. 2.)

Distinguished from *Calymperes* by the cucullate dimidiate calyptra, the peristome undeveloped or composed of 16 lanceolate entire generally horizontal teeth, and the orifice of the capsule sometimes covered by a thin membrane (*epiphragm*).

1. **S. Floridanus**, Sulliv. Plants robust, in somewhat loose tufts, glaucous-green above, dirty yellowish below; stems simple or fastigiate-ramose, more or less radiculose and tomentose the whole length: leaves close, erect, ovate-oblong at the clasping base, linear-lanceolate above, apiculate, concave-canaliculate, minutely areolate, opaque, obtusely serrulate from the middle, bilamellate upward, the lamellæ coarsely and irregularly serrate; costa thick, semiterete, papillose, vanishing at or below the apex: flowers dicœcious, becoming lateral by innovations: calyptra descending to the base of the capsule: capsule subelliptical or merely cylindrical, erect, of a thick texture; pedicel about 1 c.m. long; lid with a very long aciculate beak; peristome simple, of 16 short teeth attached far below the orifice, connivent to near the middle, distantly articulate, pale yellow without divisural line. — Mosses of U. States, 31, and Icon. Musc. 49, t. 31; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 113. *S. albovaginatus*, Hook. & Wils. in Drumm. Musc. Amer. (Coll. II.), n. 37; Sulliv. Musc. Allegh. n. 171; not Schwaegr.

HAB. On decayed logs and stumps; Louisiana, Florida, etc.; not rare.

2. **S. Texanus**, Sulliv. Resembles the last in size and aspect: stem-leaves twisted when dry, erect when moist, long linear-lingulate from the broader clasping base, blunt at the apex, canaliculate-concave; borders pellucid, irregularly ciliate-dentate by linear cells; basilar areolation large, quadrate, pellucid, the upper very small, subquadrate, opaque, papillose; costa very stout, percurrent, spinulose on the back: flowers dicœcious (male plant unknown): calyptra covering nearly the whole capsule, rugulose from the middle upward: capsule

ovate, cylindrical, slender, contracted at the orifice; pedicel comparatively long (about two c.m.); lid long and subulate-rostrate; teeth short, robust, lanceolate, obtuse, with two or three prominent articulations. — Mosses of U. States, 103, and Icon. Musc. Suppl. 32, t. 20.

Hab. San Marcos, Texas (*Wright*, who first collected the moss, though sterile); Southern States, from North Carolina to Florida, not rare.

The leaves often bear at the apex a cluster of oblong articulate bodies, like those of *Aulacomnium palustre*.

Tribe VI. TETRAPHIDEÆ.

Plants loosely tufted. Stems slender, erect or very short. Lower leaves very small, distant, squamiform, the upper longer, close and tufting at the apex of the stems. Flowers monœcious, terminal, the male gemmiform. Calyptra conical, mitrate. Capsule cylindrical or oval. Peristome formed of the operculum filled with cellular matter and cleft into four parts. Annulus none. Spores very small.

The *Tetraphideæ*, *Discelieæ* and *Schistostegeæ* constitute three peculiar groups with no marked analogy to any other tribe of mosses. The first are related by the calyptra to the *Orthotricheæ*, and by the form and areolation of the leaves to the *Bryeæ*. The growth of the *Discelieæ* is that of *Ephemerum*; their peristome like that of *Trematodon*. Hampe considers *Discelium nudum* as an annual *Bartramia*. The *Schistostegeæ* have the soft texture of the *Splachneæ*, and for that reason are considered by Schimper as most nearly related to that tribe.

62. TETRAPHIS, Hedw. (Pl. 2.)

Stems long, branching by innovations from under the apex. Leaves broadly lanceolate, costate to below the apex. Calyptra covering the capsule to the middle. Capsule cylindrical, borne on a long straight or geniculate pedicel. Teeth attached below the orifice, somewhat long, striate on the back, reddish. — *Georgia*, Ehrh.

1. **T. pellucida**, Hedw. Tufts yellowish green: perigonium often deformed, cup-shaped, of broad truncate leaves, enclosing small lenticular greenish hyaline short-pedicellate bodies: calyptra very thin, whitish below, more solid and reddish above:

capsule greenish when filled, brown with age; pedicel smooth, twisted to the left in the lower part, to the right above. — Fund. Musc. ii. 87, t. 7, f. 32, and Spec. Musc. 45, t. 7; Bryol. Eur. t. 196. *Mnium pellucidum*, Linn. Sp. Pl. 1109. *Georgia Mnemosynum*, Ehrh.; Muell. Syn. i. 180. *G. pellucida*, Rabenh.

HAB. On decayed trunks in deep woods; common.

2. **T. geniculata,** Girgens. Differs from the last in the upper leaves longer and narrower, linear-lanceolate, acuminate, the perigonium not deformed, and the pedicel geniculate in the middle. — Milde in Bot. Zeit. xxiii. 155; Schimp. Bryol. Eur. Suppl. *Tetraphis*, 1, t. 1.

HAB. Moose River (*Lyall*); Sitka (*Bischoff, Rothrock*).

63. TETRODONTIUM, Schwaegr.

Plants very small, gregarious. Stems very short, bearing flowering gemmules at the base of filiform foliate branchlets. Capsule thick, oval, covered to the base by a solid calyptra; pedicel thick, rigid. Teeth short.

1. **T. repandum,** Schwaegr. Basilar innovations erect: leaves ovate-lanceolate, rigid, reddish brown, close and imbricate; perichætial leaves ovate and oblong, very concave, obscurely costate; perigonial leaves smaller, thinner, ecostate, like those of the branchlets: capsule oval, its orifice emarginate between the teeth; lid conical, erect, short. — Suppl. ii. 102; Bryol. Eur. t. 197. *Tetraphis repanda*, Funck; Nees in Sturm's Deutschl. Fl. ii, fasc. 17, t.; Schwaegr. Suppl. ii. 21, t. 107.

HAB. On shaded rocks near the Glen House, and at Dixville Notch, White Mountains (*James*); very rare.

TRIBE VII. DISCELIEÆ.

Plants very small, nearly without stems, gemmiform, gregarious, produced from a persistent prothallium, dicœcious. Leaves oblong-lanceolate, muticous at the apex, ecostate; perichætial leaves longer; areolation loose, in long hexagonal-rhomboidal meshes. Male plants in the same prothallium as the female ones; antheridia small; paraphyses numerous, sub-

clavate. Calyptra split its whole length on one side and opened, generally remaining attached to the pedicel by its constricted base. Capsule ovate-globose, cernuous, thick, on a long reddish pedicel twisted to the right, the sporangium free. Lid large, convex, conical. Teeth of the peristome 16, simple, striolate, reddish, split from the base to the middle along the divisural line; articulations distant.

64. DISCELIUM, Brid.

The only genus, with the characters of the tribe.

1. **D. nudum**, Brid. The only species, characterized above. — Bryol. Univ. i. 366; Bryol. Eur. t. 297. *Bryum nudum*, Dicks. Fasc. iv. 7, t. 10.

Hab. Clayey ground; Canton, Illinois (*J. Wolf*). A very rare species.

Tribe VIII. SCHISTOSTEGEÆ.

Plants annual, produced from a persistent confervoidal prothallium. Stems very tender and delicate, radiculose at base, mostly simple, of two forms, the sterile frondiform, with leaves vertically inserted and confluent at their base, the fertile frondiform in the lower part, or naked, bearing the flowers at the apex with a few minute tufted and horizontally attached leaves; areolation loose. Flowers terminal, loosely gemmiform; anthers and archegonia few, without paraphyses. Calyptra minute, narrowly mitriform, covering the lid only. Capsule small, subglobose, soft, on a long soft pedicel, with distinct sporangium, thick columella, and small convex lid. Peristome none. Spores minute.

65. SCHISTOSTEGA, Mohr.

The only genus, with the characters of the tribe.

1. **S. osmundacea**, Web. & Mohr. Plants widely and loosely cespitose, about one c.m. long, bright or glaucous green, brown below, from a golden yellow shining prothallium: segments of the compound leaves rhomboidal, the simple ones lanceolate, very soft; areolation rhomboidal, slightly chlorophyllose: flowers dicœcious: lid short, with a red border. — Bot. Tasch. 92; Bryol. Eur. t. 279. *Mnium*, Dicks. l. c. i. 3, t. 1.

HAB. On the ground, under the shade of rocks; Sand Lake, New York (*C. H. Peck*); near the Profile House and the Dixville Notch, White Mountains (*Foster, James*).

TRIBE IX. SPLACHNEÆ.

Plants annual or perennial, gregarious or cespitose, increasing when perennial by subfloral innovations and dichotomously fastigiate. Leaves broadly costate; areolation composed of large soft parenchymatose cells. Flowers terminal, monœcious or diœcious, rarely bisexual, the male discoid with large pedicellate antheridia and clavate paraphyses. Calyptra cucullate or mitrate and split on one side, abruptly constricted at base, rarely conical and entire. Capsule with an apophysis varying in shape and size, erect, regular, long-pedicellate, with free sporangium and persistent columella. Lid convex-conical or hemispherical. Peristome rarely absent, of 16 geminate or 8 bigeminate linear-lanceolate flat teeth, transversely articulate, minutely punctulate, very hygroscopical. Annulus none. Spores minute.

1. *Calyptra mitriform, constricted at base: apophysis uniform in color, not enlarged with age.*

66. DISSODON, Grev. & Arn.

Leaves obovate or ovate-oblong, spatulate, entire; cells very loose, shorter in the upper part of the leaves, longer and rectangular toward the base, thin and a little chlorophyllose. Capsule erect or cernuous, oval, defluent to an obconical collum, on a solid pedicel narrowed at base. Lid convex or conical, obtuse. Teeth of the peristome 16, geminate, linear-lanceolate, acute or truncate, yellowish. Spores large, granulose.

1. **D. Hornschuchii**, Grev. & Arn. Stems radiculose: lower leaves small, broadly ovate, distant, the upper close, imbricate, much larger, broadly oblong, narrowly costate, shining green: capsule erect on a short thick pedicel, obovate with the long neck, thick, chestnut-color, very short when deoperculate and empty, with a broad orifice; lid persistent upon the

thick columella; teeth short, truncate, bifid or perforate along the divisural line, yellow. — Edinb. Mem. Wern. Soc. iii. 121; Bryol. Eur. t. 281. *Systylium splachnoides*, Hornsch., Regensb. Flora (1820), iii. 180.

HAB. Twin Lakes, Colorado; Oregon (*Downie*).

2. **D. Frœlichianus**, Grev. & Arn. l. c. In loose tufts: leaves oblong and lingulate, obtuse or blunt at the apex, concave, gradually larger and loosely imbricate from the base of the stems to the top, pale green, very thin: male and female flowers on separate innovations or bisexual: capsule erect or subcernuous, obovate-pyriform with a collum as long as the sporangium, dark orange, becoming spherical and compressed when deoperculate; pedicel 1½ c. m. long, twisted to the left when dry; lid conical, obtuse; columella contracted into the capsule; teeth linear-lanceolate, approximate in pairs. — Bryol. Eur. t. 282. *Splachnum Frœlichianum*, Hedw. Musc. Frond. iii. 99, t. 40.

HAB. Rocky Mountains (*Drummond, E. Hall*).

3. **D. splachnoides**, Grev. & Arn. l. c. Plants large, in loose tufts, green above, blackish within: leaves gradually larger upward from the base of the innovations, oblong or obovate or lingulate: capsule long-pedicellate, erect, oval, with an inflated collum perforated with stomata, orange-colored, globose-turbinate when dry and empty; lid convex-conical, obtuse, often persistent upon the columella; teeth long, linear-lanceolate, yellow, equidistant. — Bryol. Eur. t. 283. *Weisia splachnoides*, Schwaegr. Suppl. i. 63, t. 17. *Eremodon splachnoides*, Brid. Bryol. Univ. i. 234. *Weisia turbinata*, Drumm. Musc. Amer. n. 64.

HAB. Marshy spots near York Factory (*Drummond*).

67. TAYLORIA, Hook.

Plants in loose tufts, dichotomous by innovations, radiculose. Leaves open, erect, spatulate, sharply acuminate, coarsely and obtusely dentate above. Teeth of the peristome 16, attached far below the orifice, entire or bifid, linear-lanceolate or loricate, very long and hygroscopical, connivent when moistened, reflexed and appressed to the capsule or circinate-pendent when dry. Spores very small, green or yellow.

1. **T. serrata,** Bruch & Schimp. Tufts bright green; fertile stems curved down at base: leaves long, spatulate, acuminate, recurved at the apex; costa vanishing below the apex: capsule reddish brown, erect, with a long inflated collum; pedicel long, reddish, often geniculate at base; columella included; lid short, conical-obtuse. — Bryol. Eur. t. 284, 285. *Splachnum serratum*, Hedw. Spec. Musc. 53, t. 8.

Var. **flagellaris,** Bruch & Schimp. Branches slender, ascending higher than the subcernuous capsule. — *Splachnum flagellare*, Brid. Bryol. Univ. i. 247.

Hab. Fort Colville (*Lyall*); Oregon; Alaska (*Kellogg, Bischoff*).

T. tenuis, Schimp. (Syn. ed. 2, 360), long considered by European authors as a variety of the last, has been sent to Schimper from Greenland. It differs in being more slender, softer, and more loosely cespitose; leaves broadly spatulate, shortly acuminate, very thin, and more loosely areolate; capsule smaller, with a broad orifice; pedicel more slender; columella long-exserted; teeth dark purple; spores nearly twice larger and hyaline.

2. **T. splachnoides,** Hook. Gregarious or irregularly and loosely cespitose; stems soft, much divided: leaves flaccid, longer than in the preceding species, long-spatulate, lanceolate-acuminate, unequally and coarsely dentate to the middle: male buds of three leaves, terminal on long distantly foliate branchlets: capsule erect or subcernuous, elliptical-oblong, soft, greenish-yellow when filled, contracted to a narrow cylindrical neck, the whole reduced to half its length when dry; pedicel very long, pale red; lid conical, variable in length, capping the persistent columella; teeth very long, thong-shaped, purple and cleft their whole length with age, involute under the orifice of the capsule when moist, reflexed, sinuous and twisted when dry, flexible when breathed upon. — Quart. Journ. Sci. ii. 144, and Musc. Exot. t. 173; Bryol. Eur. t. 286. *Hookeria splachnoides*, Schleich.; Schwaegr. Suppl. i. 2. 340, t. 100.

Hab. Rocky Mountains of British America (*Drummond*); West Humboldt Mountains, Nevada (*Watson*).

2. *Calyptra very small, conical, cucullate: apophysis discolored with age, obovate, conical or umbrella-form.*

68. TETRAPLODON, Bruch & Schimp. (Pl. 4.)

Plants densely cespitose, pulvinate, perennial; tufts mixed with a radiculose tomentum. Leaves oblong, ovate or obovate

or lanceolate-subulate at the apex; reticulation more dense. Flowers monœcious; male flowers gemmaceous, capituliform, sessile in the axils of the leaves or terminal on separate branches. Calyptra conical, cucullate, inclined. Capsule thick, with a solid thick generally long apophysis covered with stomata. Teeth of the peristome shorter, bigeminate, solid, dark purple, reflexed when dry. Spores very small.

1. **T. angustatus**, Bruch & Schimp. Tufts compact, green outside, ferruginous within; stems slender, varying in length, much divided: leaves soft, passing from the oblong base into a very long yellowish flexuous subulate point, serrate-dentate from below the middle; costa excurrent into the point: capsule short-pedicellate, small, with larger pyriform apophysis; lid highly convex or obtusely conical; teeth approximate in pairs. — Bryol. Eur. t. 288; Schimp. Syn. 303. *Splachnum angustatum*, Linn. fil. Meth. Musc. 33; Hedw. Musc. Frond. ii. 37, t. 12. *S. setaceum*, Michx. Fl. ii. 287.

Hab. White Mountains; Adirondacks; Lake Superior; Rocky Mountains; not rare.

2. **T. mnioides**, Bruch & Schimp. Plants more robust: leaves close, imbricate, obovate-oblong, very concave, more or less abruptly narrowed into a flexuous yellowish acumen; borders entire, yellow; costa percurrent: pedicel longer, solid, dark orange, purple when old, enlarging above into an obconical-oblong dark purple apophysis longer than the fawn-colored oval capsule, which when empty is cylindrical and narrower than the apophysis; teeth linear-lanceolate, first joined in fours, then bifid, orange-colored. — Bryol. Eur. t. 289; Schimp. Syn. 304. *Splachnum mnioides*, Linn. fil. l. c. 16; Hedw. Musc. Frond. ii. 35, t. 11. *S. urceolatum*, Hedw. l. c. 39, t. 13.

Hab. Catskill and Adirondack Mountains (*Olney*, *Lesquereux*); White Mountains (*James*); Rocky Mountains (*Drummond*); Sitka (*Harrington*).

3. **T. australis**, Sulliv. & Lesq. Tufts more or less compact; plants soft, slender, green above, brownish and radiculose below, simple or sparingly fastigiate-ramose: leaves soft, distant, erect, long-lanceolate, gradually narrowly acuminate, distantly and coarsely dentate, sometimes nearly pinnatifid, rarely entire; costa ending with the apex; areolation very loose, oblong-hexagonal: flowers monœcious and dicœcious; male flowers

discoid, capituliform, terminal on separate smaller more slender plants, or gemmiform and axillary on the fertile ones: calyptra conical, not split, scarcely covering the hemispherical-conical obtusely apiculate lid: capsule oblong-oval, small, its apophysis a little broader and longer than the sporangium, gradually narrowed to a thick pedicel less than a c.m. long; teeth joined in pairs, attached near the orifice. — Musc. Bor.-Am. Exsicc. n. 151; Sulliv. Mosses of U. States, 53, t. 4, and Icon. Musc. 97, t. 58. *Splachnum setaceum*, Hook. & Wils. in Drumm. Musc. Am. (Col. II.), n. 27.

HAB. Swamps near the coast, from New Jersey to Florida; especially common in cedar swamps on the dung of mules. Also found on Isle Madam, Cape Breton (*J. A. Allen*).

4. T. urceolatus, Bruch & Schimp. Tufts compact, solid, yellowish green on the surface, pale brown or reddish and densely radiculose within: leaves loosely imbricated, oblong or obovate, subcochleariform, abruptly narrowed into a flexuous awn-shaped point, very entire; costa very narrow, ending below the point; cells rectangular, narrow, thick-walled: male flowers at first terminal, then thrown aside and lateral by innovations: calyptra comparatively large, split and laciniate at base, straw-colored: capsule short, cylindrical, slightly longer than its broad obovate apophysis, becoming broader and black with age, narrowed to a thick short pedicel; teeth short and geminate, narrow, orange-colored. — Bryol. Eur. t. 209.

HAB. Alpine regions of the Rocky Mountains (*Drummond*); Colorado (*Downie*); rare.

69. SPLACHNUM, Linn. (Pl. 4.)

Plants mostly annual, loosely cespitose; branches soft, slender. Lower leaves distant, open, the upper tufted, with a soft costa and areolation very loose. Flowers diœcious, rarely monœcious, the male terminal and discoid, on slender naked branches. Calyptra small, conical, slightly split or mostly entire at base, soft and fugacious. Capsule long-pedicelled, small, oval or short-cylindrical, or with a larger apophysis increasing after maturity, becoming pyriform or globose or umbrella-shaped and diversely colored. Columella capped, generally exserted after the separation of the lid. Teeth of the peristome 16, linear,

geminate, orange-colored, formed of a double lamina, the outer thicker and papillose, the inner loosely and thinly areolate. Spores very minute.

1. **S. Wormskioldii,** Hornem. Monœcious: perennial, in soft dense tufts reddish and radiculose within; stems very slender, dichotomous: leaves very soft and loosely areolate, oval, muticous or more or less long-acuminate, narrowly costate: male flowers terminal on long slender branches: capsule small, elliptical or subglobose, about as long as the ovate apophysis, shorter and turbinate when empty, first green, then dark brown, stomatose; columella not exserted from the empty capsule; teeth small, yellow, subequidistant. — Fl. Dan. t. 1659; Bryol. Eur. t. 291.

HAB. Peat bogs of Arctic America, Greenland, etc.

2. **S. sphæricum,** Linn. fil. Dicœcious: loosely cespitose, annual; stems short: lower leaves small, ovate-acuminate, the upper much larger, broadly obovate from the narrowed base, acuminate, entire or obscurely dentate: capsule oval, fuscous; apophysis broader, subglobose, dark red, shining, perforated by stomata in its upper part; pedicel long, slender, flexuous; lid convex, mamillate; teeth large, linear, obtuse, approximate in pairs, orange. — Meth. Musc. 33, t. 1, fig. 1; Bryol. Eur. t. 292.

HAB. Rocky Mountains (*Drummond*).

3. **S. vasculosum,** Linn. Dicœcious: biennial or perennial; tufts soft, bright green: leaves large, distant, the lower suborbicular, the upper broadly obovate, obtusely acuminate, entire; costa ending below the apex: male plants more slender, with smaller and more distant leaves: capsule short, cylindrical, red-orange, on a large spherical minutely tuberculose dark purple or bluish black apophysis, irregularly wrinkled when dry; lid hemispherical, yellow; teeth in pairs, short, orange-colored. — Sp. Pl. ed. 2, 1572; Bryol. Eur. t. 294.

HAB. Hudson's Bay (*Drummond*); Sitka (*Bischoff*).

4. **S. ampullaceum,** Linn. Monœcious and dicœcious: loosely cespitose; stems generally short, annual or biennial: lower leaves lanceolate, the upper obovate, long-lanceolate, acuminate, more or less coarsely serrate above, very soft, pale green: capsule small, narrowly oval, cylindrical, yellowish; apophysis large, enlarged upward, pyriform, soft and fleshy,

purple when old, gradually narrowing to a long purple pedicel; lid highly convex or short-conical, obtuse; teeth approximate or united in pairs, yellow. — Sp. Pl. 1108; Bryol. Eur. t. 293.

HAB. Cranberry swamps of Ohio, New England, Pennsylvania, New Jersey, and northward; rare.

5. **S. rubrum,** Linn. l. c. Dicœcious: loosely tufting, annual; stems short: leaves large, open, recurved at the apex, enlarged in the middle from a narrowed base, more abruptly narrowed and lanceolate, long-acuminate upward, distinctly serrate from below the middle: male plants much smaller, with smaller leaves: capsule small, oval-truncate, thin, membranaceous, dirty yellow; apophysis very large, campanulate, umbrella-shaped, purple, on a very long reddish pedicel; lid highly convex; teeth 16, large, densely articulate, joined in pairs at base and sometimes at the apex, the dividing line effaced at the apex. — Bryol. Eur. t. 295.

HAB. Rocky Mountains (*Drummond*); Maine (*A. Young*).

6. **S. luteum,** Linn. l. c. Differs from the last only in the leaves not as coarsely dentate, and the umbrella-like apophysis convex and bright yellow; the teeth are a little narrower. — Bryol. Eur. t. 296. *S. melanocaulon,* Schwaegr. Suppl. ii. 1. 28, t. 109; Mitten, Journ. Linn. Soc. viii. 22.

HAB. Western North America, from several collectors, according to Mitten, who states that specimens collected by Burke in the Rocky Mountains show an extraordinary variation in the capsules.

TRIBE X. PHYSCOMITRIEÆ.

Plants annual, rarely biennial, small, gregarious or subcespitose, of soft texture, sparingly branching by innovations. Leaves comparatively large, soft, composed of large thin hyaline hexagonal or rhomboidal-oblong cells, and with a thin loosely areolate costa, obovate or spatulate-acuminate. Flowers monœcious or dicœcious, the male discoid, axillary, terminal only in young plants. Calyptra tetragonal, vesicular when young, cucullate or mitriform. Capsule oval or spherical, erect, regular or cernuous-gibbous; the sporangium free, adherent to the capsule by filaments. Lid convex or mamillate. Peristome none or simple or double.

70. PYRAMIDULA, Brid.

Calyptra large, enclosing the capsule, dehiscent by a lateral cleft. Orifice of the capsule naked. Spores very large, smooth.

1. **P. tetragona,** Brid. Stems short, simple: leaves ovate-oblong, gradually acuminate or cuspidate by the excurrent costa, concave and entire: male buds at the base of the fertile plants: capsule globose, short-pedicellate, with inflated collum; lid convex, obtusely apiculate. — Musc. Recent. Suppl. iv. 20. *Physcomitrium tetragonum*, Bruch & Schimp. Bryol. Eur. t. 298; Sulliv. Mosses of U. States, 52.

Hab. Sandy soil, San Marcos, Texas (*Wright*); sandy plain near the depot at Vincennes, Indiana (*Lesquereux*); plains of Colorado (*E. Hall*).

71. APHANORHEGMA, Sulliv. (Pl. 4.)

Plants gregarious or subcespitose, whitish green. Stems short, sparingly dividing by innovations. Flowers monœcious or occasionally synœcious. Calyptra narrowly conical, mitriform, covering the upper part of the capsule by its lobate base. Capsule immersed, very shortly pedicellate, splitting in the middle at maturity, without decoloration at the line of separation.

1. **A. serratum,** Sulliv. Lower leaves open, flexuous, the upper close, nearly erect, oblong and spatulate-lanceolate, short-acuminate, serrate from the middle upward; costa percurrent; basilar cells large, rectangular, the marginal often yellowish: capsule globose, minutely papillose at the apex: spores tuberculate. — Mosses of U. States, 52, t. 4, and Icon. Musc. 95, t. 57. *Schistidium serratum*, Hook. & Wils. in Drumm. Musc. Am. n. 20; Sulliv. Mem. Amer. Acad. n. s. iii. 60, t. 2, C. *Physcomitrium serratum*, Muell. Syn. ii. 545.

Hab. Damp clayey ground, river-banks, road-sides in the woods, and in open cultivated ground in the Northern and Middle States; not rare.

72. PHYSCOMITRIUM, Brid. (Pl. 4.)

Plants simple or sparingly branching at base by innovations. Calyptra scarcely descending to the middle of the capsule. Capsule regularly dehiscent with a distinct naked orifice.

1. **P. immersum,** Sulliv. Plants small, annual, gregarious or widely subcespitose, green: leaves large, obovate or lingu-

late, lanceolate, acuminate, more distinctly serrate from the middle upward than those of *Aphanorhegma;* marginal cells yellow: male flowers terminal on young plants, becoming lateral by the growth of the fertile innovations: calyptra erect, long-beaked, mitrate, quadrilobate, scarcely reaching to the middle of the lid: capsule short-pedicellate, immersed, subglobose; lid large, hemispherical, convex, apiculate. — Mosses of U. States, 51, t. 4, and Icon. Musc. 93, t. 56.

Hab. River banks, Southern Ohio (*Lea*); Western Pennsylvania (*Lesquereux*); South Carolina (*Ravenel*).

Differs from *Aphanorhegma* merely in the inflorescence, the dehiscence of the lid, and the leaves more distinctly serrate by yellowish cells.

2. **P. pygmæum,** James. Plants still smaller than in the last; stems prostrate at base, radiculose, bipartite: leaves soft, whitish green, the lower distant, flexuous, the upper loosely tufted, ovate-lanceolate, slightly serrate; costa percurrent or vanishing below the apex; marginal cells transversely oblong, in 5 to 7 rows: capsule oblong, pyriform when empty; lid comparatively long; annulus narrow, persistent; pedicel twisted to the left. — Bot. King Exp. 404.

Hab. On the ground above Parley's Park, in the Wahsatch Mountains, Utah, at 6,500 feet altitude (*Watson*); a few imperfect specimens.

The small size of the plants and their prostrate black radiculose stems separate this species from all its congeners. It closely resembles *P. Hookeri,* but differs in its size, the narrow annulus, etc.

3. **P. pyriforme,** Brid. Densely gregarious or widely and loosely cespitose; plants robust, yellowish green: leaves open or flexuous, soft, the lower distant, ovate-lanceolate, the upper tufting, spatulate or oblong-lanceolate, concave, serrate from the middle upward; costa vanishing below the apex: calyptra large, mitriform, descending to the middle of the capsule: capsule large, long-pedicellate, orbicular-pyriform, the cells surrounding the orifice transversely rectangular in multiple series; lid convex-conical, obtusely apiculate or rostellate. — Bryol. Univ. i. 98 (under *Gymnostomum*); Bryol. Eur. t. 299. *Gymnostomum pyriforme,* Hedw. Fund. Musc. ii. 87.

Hab. On wet open and shaded ground, wet meadows; very common. The variety described below in Florida (*Daniel B. Smith, Garber*).

Plants very variable in size, appearance, color, etc., according to habitat. Luxuriant in wet places, with longer larger whitish green leaves and longer operculate capsule, on reaching dry ground it gradually becomes short and yellowish, with shorter-pedicellate nearly globose capsule

and shorter mamillate lid. A marked variety from Florida may be a distinct species. It has longer narrower leaves, very flexuous and nearly twisted, deeply dentate, and with stronger percurrent costa. The long slender pedicellate capsule, with a short obtuse lid, is generally gibbous on one side, widely enlarged at the orifice and cupuliform when empty. Another variety, *Gymnostomum tortipes*, Brid., has long flexuous slender stems, with distant narrowly lanceolate acuminate leaves dentate at the apex, the pyriform capsule distinctly inflated at the collum and narrowed at the orifice.

4. **P. Hookeri,** Hampe. Much like small forms of *P. pyriforme*, from which it differs in the broadly oval gradually acuminate leaves, with borders entire or very slightly serrulate below the apex, by the protrusion of the marginal cells, the quadrate smaller upper cells, and the short thick pedicel of the oval obconical capsule, which is slightly constricted under the broad orifice, rugose and gradually passing into a thick undefined collum. The annulus is thick, broad and persistent, adhering to the orifice or falling piecemeal. — Icon. Musc. under t. 30. *Gymnostomum turbinatum*, Michx. Fl. Bor.-Am. ii. 286. *G. latifolium*, Drumm. Musc. Amer. n. 16; Schwaegr. Suppl. iv., t. 304, B. *P. latifolium*, Lindb. Öfvers. Akad. xxi. 595 (1864). *P. hians*, Lindb. Manip. Musc. i. 51 (1870); Sulliv. Icon. Musc. Suppl. 26, t. 16.

Hab. Wet meadows and marshy fields, in the Western States, often mixed with *P. pyriforme*.

5. **P. acuminatum,** Bruch & Schimp. Plants shorter than in *P. pyriforme*, generally stouter and less divided: the leaves ovate-lanceolate, acute, concave, very entire or obscurely serrate at the apex, yellowish-margined at the base; costa percurrent or excurrent: calyptra large, sometimes persistent after maturity of the capsule: capsule spherical with inflated collum, constricted under the orifice when empty; lid short, convex, apiculate: spores large. — Bryol. Eur. t. 300. *Gymnostomum acuminatum*, Schleich. Cat. Pl. Helv. ed. 4, 40.

Hab. Texas (*Wright*); Illinois (*E. Hall*).

6. **P. turbinatum,** Muell. ined. Plants cespitose, much divided, straw-color: leaves open and flexuous, oblong and narrowly lanceolate, distinctly acuminate by the excurrent costa, entire at the apex; areolation smaller and more compact: male plants terminal: capsule long-pedicelled, broadly ovate-turbinate; lid small, rostrate.

Hab. Texas (*Boll*).

From imperfect specimens kindly communicated by Mueller we find that, as in *P. acuminatum*, the leaves are entire at the apex, or nearly so, and the form of the operculate capsule is nearly the same. It differs, however, in the larger leaves, not ovate but rather linear, the capsule longer-pedicellate, without collum, and the lid longer-mamillate or obtusely rostrate. The stems are much longer and more divided; the male branches long, like the fertile innovations.

73. ENTOSTHODON, Schwaegr. (Pl. 4.)

Plants annual or reproduced by innovations, simple or branching. Leaves variable, even in the same species, with a loose hyaline soft areolation. Flowers monœcious, terminal, the male on the primary stems, the fertile on the innovations; antheridia short; paraphyses inflated at the apex. Calyptra vesiculose-cucullate, long-beaked, shining. Capsule thick, subcernuous or pyriform in connection with its collum; marginal cells rectangular, in many transverse series; lid small, planoconvex. Peristome attached far below the orifice, either very rudimentary, or, as in all the American species, of 16 distantly articulate teeth, trabeculate on the inside, narrow, confluent at base. Annulus none. Spores large.

1. **E. Drummondii,** Sulliv. Plants cespitose, gregarious, yellowish green; stems very short: leaves tufted, obovate, lanceolate or lingulate-lanceolate, concave, more or less distinctly crenulate by the prominence of the yellowish marginal cells: capsule short, symmetrical, oblong-pyriform and enlarged at the orifice when empty; pedicel comparatively long, flexuous; lid convex, apiculate; teeth linear-lanceolate, dark red, granulose, striolate lengthwise; articulations distant: spores reddish brown, subpapillose. — Mosses of U. States, 51, t. 4, and Icon. Musc. 91, t. 55; Sulliv. & Lesq. Musc. Bor.-Am. n. 156[b]. *E. obtusifolius*, Hook. & Wils., Drumm. Musc. Am. (Coll. II.) n. 36; not of Hook. fil. *Funaria Drummondii*, Lindb. Manip. Musc. i. 62.

Hab. Moist clay soil, Louisiana (*Drummond*); near Montgomery, Alabama (*Sullivant*); rare.

2. **E. Bolanderi,** Lesq. Plants gregarious; stems longer than in the last species: stem-leaves very few, the upper loosely tufted, obovate, lanceolate-acuminate, with borders entire,

hyaline; costa short, scarcely passing above the middle: male flowers in smaller buds at the base of the fertile ones: capsule pyriform, gradually defluent to a long slightly inflated collum; lid highly convex, mamillate; teeth pale, whitish, granulose; articulations and dividing line very obscure. — Trans. Amer. Phil. Soc. xiii. 10; Sulliv. & Lesq. Musc. Bor.-Am. (ed. 2), n. 236; Sulliv. Icon. Musc. Suppl. 28, t. 17.

Hab. On clayey soil near the bay of San Francisco (*Bolander*).

A very distinct species, even deviating somewhat from the generic characters in its broad very soft entire leaves, costate only to the middle, while in its inflorescence it resembles *Funaria*, and in its calyptra, which is five-lobed at base and rather mitrate, it is like a *Physcomitrium*.

3. **E. Templetoni,** Schwaegr. More or less densely gregarious: stem-leaves few, distant, the upper tufted, broadly obovate or spatulate-oblong, acuminate; border narrow; cells more or less unequal, yellow; costa dividing below the acumen: capsule defluent into a long collum, pyriform, obconical and truncate, furrowed when empty; teeth lanceolate-subulate, reddish, papillose, distantly articulate; articulations prominent on the sides: spores verruculose. — Suppl. ii. 1. 44, t. 113; Bryol. Eur. t. 302. *Weissia Templetoni*, Hook. in Curt. Fl. Lond. i, t. *Funaria attenuata*, Lindb. Manip. Musc. i. 63.

Hab. Swamp near Mendocino, California (*Bolander*).

74. FUNARIA, Schreb. (Pl. 3.)

Habit, mode of growth, form of leaves, reticulation and calyptra as in the preceding genus. Capsule gibbous, obtusely pyriform, narrowed to a more or less elongated curved collum; pedicel generally long, straight, or arcuate above; lid plano-convex; annulus none or compound and revoluble. Peristome rudimentary or more generally double, the outer of 16 teeth, very hygrometrical, obliquely curving to the right, prominently trabeculate on the inner side with purple striæ, pale and granulose on the outside, connected at the apex by a small reticulated disk; inner membrane divided into 16 cilia opposite to the outer teeth and adhering at the base, lanceolate or more or less rudimentary, yellowish, with a longitudinal medial line, distantly papillose. Sporangium much smaller than the capsule, attached to it by loosely entangled filaments. Spores generally large.

* *Peristome perfect: annulus none.*

1. **F. Americana,** Lindb. Plants small, gregarious or loosely cespitose; stems very short: leaves half open, oblong-ovate, acuminate, loosely areolate, borders nearly entire; costa excurrent: capsule erect, subcernuous, rugulose at the long inflated collum; pedicel short, twisted to the left in its lower part, to the right in the upper when dry; lid conical, obtuse. — Öfvers. Akad. xx. 398, and xxi. 597; Sulliv. Icon. Musc. Suppl. 30, t. 19. *F. Muhlenbergii*, Hedw. fil. in Turn. Musc. Hibern. 106 (name only); Schwaegr. Suppl. i. 2. 78, t. 66, mainly, excl. descr.; Sulliv. Mosses of U. States, 51.

HAB. Pennsylvania (*Muhlenberg, James*).

2. **F. Mediterranea,** Lindb. l. c. Plants ½ to 1 c.m. long, loosely cespitose: lower leaves distant, oblong-lanceolate, deflexed, the upper open, erect or spreading, ovate-oblong, abruptly narrowed to a long filiform flexuous acumen, obscurely serrate or nearly entire above; costa vanishing below the apex: capsule clavate-pyriform; lid convex-conical; pedicel twisted both ways as in the preceding species. — *F. Muhlenbergii*, Turn. in Koen. & Sims, Ann. Bot. ii. 198; Bryol. Eur. t. 303. *F. calcarea*, Schimp. Syn. 320, excl. syn.; Watson, Bot. Calif. ii. 388, in part.

HAB. California (*Bigelow, Bolander*).

3. **F. calcarea,** Wahl. Plants slightly larger than in the former species: leaves oblong-lanceolate, gradually narrowed to a straight acumen, sharply serrate: capsule obovate, turgid, with a long less inflated collum; pedicel longer, twisted to the left its whole length. — Vet. Akad. Handl. xxvii. 137, t. 4, f. 2. *F. Hibernica*, Hook. in Curt. Fl. Lond. ii, t.; Bryol. Eur. t. 304.

HAB. British America (*Drummond*); Utah (*Watson*).

4. **F. serrata,** Brid. Plants short, dirty green, loosely cespitose: leaves tufted, oblong-lanceolate or lingulate-lanceolate, short-pointed, serrate above; costa vanishing below the apex: capsule pyriform on a long pedicel twisted to the left when dry; lid convex, apiculate. — Musc. Recent. Suppl. iii. 70; Sulliv. Icon. Musc. 89, t. 54.

HAB. Moist clay banks and sand rocks, Southern States.

5. **F. Californica,** Sulliv. & Lesq. Plants very small, pale green, loosely cespitose: stem-leaves few, small and distant;

upper leaves tufted, erect, oblong, short-pointed, concave, very entire; areolation more compact; costa subcontinuous: capsule erect, oblong or obovate, symmetrical, gradually narrowing to the short collum; pedicel short, straight, twisted to the left; lid convex, subconical. — Musc. Bor.-Amer. Exsicc. (ed. 2), n. 238; Sulliv. Icon. Musc. Suppl. 29, t. 18.

Hab. Clay soil; Auburn, Ukiah, etc., California (*Bolander*); Oregon (*Hall*).

* * *Annulus large, revolute.*

6. **F. convoluta,** Hampe. Plants short, loosely cespitose: outer leaves spreading, with borders involute, the inner convolute, and infolding the pedicel, oblong-ovate, acute, entire; costa percurrent: capsule obliquely pyriform, more or less plicate; pedicel rather long; lid umbonate, acute. — Linnæa, xxx. 455.

Hab. Sierra Nevada, California (*J. A. Bauer*).

According to the author this species resembles *F. calvescens*, Schwaegr., differing in its shorter leaves with a smaller areolation, the lid prominently umbonate (not flat), and the teeth yellowish, not blackish.

7. **F. flavicans,** Michx. Plants soft, loosely cespitose: stem-leaves distant, very small; upper leaves tufted, large, very soft and loosely areolate, oblong-spatulate or obovate, entire; costa percurrent: capsule curved downward or horizontal, pyriform, gradually attenuated to a very long pedicel; lid planoconvex, subapiculate. — Fl. Bor.-Am. ii. 303; Sulliv. Mosses of U. States, 50, and Icon. Musc. 87, t. 53.

Hab. Moist sandy and clayey ground; Middle and Southern States.

It differs from *F. hygrometrica* in the pale color of the plants, especially of the capsule, the leaves more abruptly narrowed into a long flexuous point, the mouth of the capsule more enlarged and less oblique, and the spores larger.

8. **F. hygrometrica,** Sibth. Plants variable in size, simple or divided from the base: comal leaves erect, pressed together, rarely open, oblong-ovate, short-pointed, entire, costate to the apex: capsule arched and turgid on the upper side, pyriform, coriaceous, reddish, deeply furrowed; pedicel very long, flexuous; lid convex. — Fl. Oxon. 288; Bryol. Eur. t. 305. *Mnium hygrometricum*, Linn. Sp. Pl. 1110.

Var. **calvescens,** Bruch & Schimp. Leaves open-spreading, the comal flexuous on the borders, twisted when dry. — *F. calvescens*, Schwaegr. Suppl. i. 2. 77, t. 65.

Var. **patula**, Bruch & Schimp. Comal leaves narrower, spreading; costa percurrent. — *F. Ravenelii*, Aust., Coult. Bot. Gaz. i. 29.

HAB. Bare ground, moist sand and rocks; very common. The varieties mostly in the Southern States.

9. **F. microstoma**, Bruch & Schimp. Differs from the last in its smaller size, the capsule pyriform, more turgid and thicker, dark brown and shining, the lid much smaller and mamillate, the internal peristome very imperfect, and the spores twice as large. — Bryol. Eur. t. 306.

HAB. Moist gravelly ground; Soda Springs on the Upper Tuolumne, California (*Bolander*); Illinois (*Patterson, Schneck*).

TRIBE XI. BARTRAMIEÆ.

Plants perennial, dichotomous or branching by subfloral innovations. Leaves varying from ovate-lanceolate to subulate, costate, papillose on both faces; areolation minute and quadrate above, loose and hexagonal-rectangular at base. Flowers bisexual, monœcious or diœcious, the male generally discoid in the diœcious species. Calyptra small, cucullate, very fugacious. Capsule spherical or nearly so, without collum or with an indistinct one, cernuous or rarely erect, plaited-striate when dry or rarely smooth. Lid small, muticous. Peristome none or simple or more generally double with the segments of the inner membrane split into two diverging parts; cilia none or simple and more or less distinct. Annulus none.

75. BARTRAMIA, Hedw. (Pl. 3.)

Stems erect and dichotomous, radiculose-tomentose below. Leaves opaque, yellowish green, half-clasping or subdecurrent at base, serrate at the apex; costa round, vanishing with the apex or passing above it into a point hispid on the back. Capsule globose or broadly ovate; lid small, convex or obtusely pointed. Teeth of the outer peristome attached to the basilar membrane passing above the orifice, lanceolate, transversely articulate, lamellate inside, marked on the back by a dividing line. Spores minute, hispid, yellowish brown.

* *Capsule erect, symmetrical: peristome none or simple.*

1. **B. Menziesii,** Turn. Plants more or less densely cespitose; stems 5 to 10 c.m. long or more, simple or sparingly branched, brown within the tufts, bright or yellowish green above: leaves closely imbricate, erect or half open, concave, plicate and reflexed on the borders at the enlarged ovate base, lanceolate, subulate-dentate above; costa stout, percurrent, rough on the back; perichætial leaves similar; perigonial broadly ovate, deeply concave at base, abruptly long-subulate, scabrous on the back: flowers diœcious; male plants simple, shorter, the flowers terminal or lateral by innovations, gemmaceous; antheridia curved, yellowish brown with numerous long filiform paraphyses; fruiting flowers lateral by innovations: capsule erect, broadly oval, symmetrical, pale brown; pedicel short, 1 to 2 m.m. long, pale red or dark yellow, twisted to the left; lid conical, obtuse: peristome simple, of 16 short lanceolate irregularly articulate reddish teeth, sometimes rudimentary or none.—Koen. & Sims, Ann. Bot. i. 525, t. 11, f. 1; Hook. Musc. Exot. t. 67; Schwaegr. Suppl. iii, t. 240; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. (ed. 2), n. 259; Sulliv. Icon. Suppl. 39, t. 26. *Glyphocarpa Baueri*, Hampe, Linnæa, xxx. 457.

Hab. California, not rare; Spokan Falls (*Watson*). The normal form on shaded rocks in the woods, varying on dry exposed rocks.

The species varies according to its habitat. On dry exposed rocks the stems are shorter, the slightly shorter and narrower leaves, appressed when dry, are open and erect when moistened; the capsule is somewhat longer and narrower; the peristome either wanting or fragmentary and reduced to a pellucid membrane more or less irregularly lacerated. This is the variety n. 260 of the Musc. Exsicc. (n. 259 by mistake), and represents *Glyphocarpa Baueri.* It is not possible to ascertain which of the two forms represents the original species of Hooker, as no author appears to have seen the peristome complete. The specimens in Taylor's herbarium have longer stems and short oval capsule, like the normal form, but no peristome, and therefore combine characters of both forms.

2. **B. subulata,** Bruch & Schimp. Plants in short compact tufts; stems slender: upper leaves more densely crowded, erect-open, strict, rigid, glaucous-green when young, linear-subulate and sharply serrate above the ovate half-clasping base; costa subpercurrent: flowers androgynous; antheridia mixed with the archegonia or separated by a single leaf only: capsule on a strict short reddish pedicel, globose-ovate, marked from

the middle upward with obscure striæ, furrowed-plicate when dry and empty; lid small, convex, conical; teeth either present, narrow, unequal and orange-colored, or absent and the orifice surrounded by a short thin pellucid membrane. — Bryol. Eur. t. 315.

HAB. Colorado (*Brandegee*); Sitka (*Rothrock*); Flower Bay, Alaska (*Dall*).

3. **B. stricta,** Brid. Tufts compact, glaucous-green above: leaves open, erect, strict, straight and fragile when dry, lanceolate-subulate, serrate above; meshes of the areolation smaller than in the preceding species; costa excurrent into a spinescent awn: flowers bisexual: capsule ovate-globose, erect, rarely slightly cernuous, sulcate-ribbed when dry; pedicel strict, obscurely tetragonal above and twisted to the right; lid convex, obtuse, short-mamillate and erose; teeth either regular and entire or irregular at the borders, perforated along the dividing line, yellow: spores verrucose. — Musc. Recent. ii. 3. 132, t. 1, f. 5; Bryol. Eur. t. 316.

HAB. Rocks near San Francisco (*Bolander, Gibbons*); Colorado (*Parry*).

* * *Capsule curved; lid oblique; peristome double.*

4. **B. ithyphylla,** Brid. l. c. Stems longer than in the last: leaves open-erect, strict, enlarged, white and clasping at base, linear-subulate and coarsely serrate above; costa thick, gradually occupying the whole lamina above: flowers bisexual: capsule globose-oblong, more distinctly curved and deeply furrowed when dry; lid conical-obtuse; teeth reddish brown, irregularly perforated, sometimes bifid at the apex; inner segments yellow, cleft, much shorter than the teeth. — Bryol. Eur. t. 317.

HAB. Fissures of rocks on mountains; White Mountains, Adirondacks, Rocky Mountains, Sierra Nevada and Cascade Mountains, Sitka, etc. Also rarely on the plains; Fayette County, Pennsylvania (*Knight*). Varies with shorter fragile leaves, not as white at the base, and not as abruptly narrowed above it.

5. **B. Œderiana,** Swartz. Plants slender, loosely tufted, dark green above: leaves open and recurved, soft, twisted when dry, narrowly lanceolate, plicate, carinate and serrate toward the apex; borders more or less revolute; costa narrow, percurrent, serrate on the back above: flowers bisexual: capsule small, globose or ovate-oblong, incurved and ribbed when dry; pedicel slender and slightly curved, of medium length; lid and

peristome as in the following. — Schrad. Journ. Bot. iv. 180. *B. gracilis*, Floerke; Muell. Syn. i. 508. *B. Œderi*, Schwaegr. Suppl. i. 2. 49, t. 59; Bryol. Eur. t. 318.

Hab. On wet rocks in mountains, or northward, from New England to the Rocky Mountains and Canada.

Variable, in more or less compact densely tomentose tufts. The dark green color of the tufts, the slender stems, and the shorter leaves give to this moss an appearance different from that of the following species.

6. **B. pomiformis**, Hedw. Tufts deep, flat and wide, or smaller and pulvinate, yellowish green above, pale brown and tomentose within: leaves open or erect-spreading, curved or cirrhate when dry, lanceolate, carinate, sharply serrate above, the borders revolute from the middle downward; costa percurrent or excurrent into a short spinulose awn: flowers androgynous (male and female flowers contiguous): capsule spherical, long-pedicellate; outer teeth regular, densely articulate; segments shorter than the teeth, cleft open; cilia simple, short or rudimentary. — Spec. Musc. 164; Bryol. Eur. t. 319. *Bryum pomiforme*, Linn. Sp. Pl. 1115.

Var. **crispa**, Schimp. Stems and leaves longer, narrower, cirrhate-twisted when dry: capsule short-pedicellate. — *B. crispa*, Swartz.

Hab. Shady banks and fissures of rocks; common on the eastern slope, in valleys and mountains; Columbia River, Oregon (*Hall, Nevius*).

7. **B. Halleriana**, Hedw. Plants soft, in bright green tufts: leaves long, narrowly subulate from an enlarged whitish half-clasping base, serrulate above, spreading all around the stems or inclined on one side, flexuous when dry: flowers as in the preceding species: capsule on a short curving pedicel, often binate, becoming lateral or as if axillary by the continuous innovations of the stems, pale brown; lid very small, convex-conical; teeth dark brown, incurved when dry. — Musc. Frond. ii. 111, t. 40; Bryol. Eur. t. 320.

Hab. Rocky Mountains, Portage River (*Drummond*).

8. **B. radicalis**, Beauv. Plants soft, loosely tufted, glaucous-green, tomentose their whole length; stems short, prostrate at base, branching from below the floriferous apex: leaves erect, open and subsecund, linear-lanceolate, cuspidate by the excurrent costa, sharply serrate, papillose on the inner face only; perichætial broadly ovate, abruptly and narrowly long-acuminate from the enlarged base: flowers monœcious, the

male gemmaceous, close to the fertile ones; perigonial leaves broadly concave at base, long-subulate above: capsule on a long slender flexuous pedicel, globose, subhorizontal; lid very small, conical-apiculate; teeth lanceolate-subulate at the apex, dark orange, longer than the segments; cilia short or rudimentary. — Prodr. 44; Sulliv. Mosses of U. States, 50, and Icon. Musc. 85, t. 52.

HAB. On the ground in wet springy places and margins of swamps in the Southern States; not uncommon.

Allied to *B. rigida*, a European species, which has less linear leaves with only the lower surface papillose, reflexed margins, a thicker shorter pedicel, and an oblong-globose capsule with a thicker outer membrane.

B. WILSONI, Muell., is reported in Rau & Hervey's catalogue as found in New Jersey by *Austin*. We have seen no other mention and no specimens of it. It is a small plant, with soft subsecund leaves; capsules aggregated in the same perichætium, very soft, on arcuate pedicels, globose-pyriform, without peristome.

76. CONOSTOMUM, Swartz. (Pl. 3.)

Plants erect, in small compact tufts, fastigiately branching, tomentose-radiculose. Stem-leaves equal, the comal longer, densely crowded, imbricate in five ranks, the stem appearing pentagonal; areolation of the leaves the same as in *Bartramia*. Flowers dicœcious, the male discoid. Calyptra cucullate, persistent. Capsule long-pedicellate, cernuous, inflated, obovate from a short collum; lid small, straight-beaked. Peristome simple, of 16 solid linear-lanceolate teeth, joined into a cone and agglutinate at the apex.

1. **C. boreale**, Swartz. Tufts glaucous-green above: lower leaves lanceolate, costate to below the apex, the upper narrowly lanceolate, longer cuspidate by the excurrent costa, all carinate, serrate above, opaque and brittle; perichætial leaves numerous, larger, thinner, with a slender costa; outer perigonial leaves lanceolate from a broadly concave base, the inner gradually shorter: capsule sulcate when dry, cernuous; teeth latticed, purple. — Schrad. Neu. Journ. Bot. i. 3. 26, t. 4. *Bryum tetragonum*, Dicks. Fasc. Crypt. ii. 8, t. 4. *Bartramia conostoma*, Bruch & Schimp. Bryol. Eur. t. 322.

HAB. White Mountains (*Oakes, James*); Adirondack Mountains (*Lesquereux*); Rocky Mountains (*Drummond*); Alaska (*Dall*).

77. PHILONOTIS, Brid.

Plants short, reclining at base, or long and erect, branching by dichotomous innovations and by fasciculate branchlets verticillate in fours at the floriferous apex, radiculose-tomentose. Stem-leaves nearly equal, small for the size of the plants, erect or a little inclined to one side, lanceolate, sharply serrate, papillose on the angles of the areoles. Flowers monœcious and diœcious, the male discoid in the diœcious plants. Capsule long-pedicelled, cernuous, globose, striate. Lid small, oblique. Inner peristome distinctly ciliate.

1. **P. Muhlenbergii,** Brid. Diœcious: plants loosely and widely cespitose; branches numerous, nearly simple, slender, flexuous, with fasciculate branchlets: stem-leaves erect, subsecund on the fruiting stems, lanceolate, acute, remotely cirrhate, bright green; costa thick, rusty, excurrent; inner perichætial leaves much smaller, lanceolate, obtuse, tender, whitish, strongly nerved: capsule globose, horizontal, very short-necked, ribbed; lid convex, acuminate or mucronate; segments nearly as long as the teeth; cilia 2, short, rudimentary. — Bryol. Univ. ii. 22. *Bartramia Muhlenbergii*, Schwaegr. Suppl. i. 2. 58, t. 61. *B. Marchica*, Sulliv. Mosses of U. States, 49.

Var. **tenella,** Brid. Very small, densely cespitose; branchlets 5 to 10, unequal, secund or recurved, short and slender: leaves short, lanceolate; capsule globose-oblong. — *Bartramia tenella*, Muell. Syn. i. 481.

Hab. Springs in sandy hills and rocks; common in Ohio and Pennsylvania. The variety is given in Rau & Hervey's catalogue on Austin's authority as from Florida. It is a West Indian and South American form.

The characters indicated by Schwaegrichen and Mueller as separating this species from *P. Marchica*, Brid., are not important. They consist merely in the numerous long simple slender fasciculate branches, which in *P. Marchica* are described as of various lengths, and in the inner perichætial leaves much smaller than the external ones, obtuse, strongly nerved and whitish, while in *P. Marchica* they are as long or even longer.

2. **P. Macounii.** Plants very short and slender, loosely cespitose, dirty or yellowish green: leaves narrowly ovate-lanceolate, long-acuminate, subulate, strongly serrate and flexuous to the apex; areolation quadrate, slightly papillose;

branch-leaves smaller, subfalcate; perigonial leaves open-erect or somewhat spreading, flexuous, lanceolate-acuminate from a broadly oval much enlarged base; perichætial leaves longer, striate, subulate: capsule ovate or subglobose, greenish yellow, cernuous, on a short thick blood-red pedicel; lid conical, acute; segments a little shorter than the teeth; cilia none.

Hab. Vancouver Island (*Macoun*).

A slender delicate species related to *P. Muhlenbergii*, differing in the longer-acuminate subulate leaves, with shorter quadrate and less papillose areolation, the perigonial leaves longer and acuminate, flexuous at the point, etc. The form of the capsule is the same; the pedicel shorter, thick, not geniculate at base.

3. **P. fontana,** Brid. In wide more or less compact yellowish green tufts; stems long, simple or dichotomous; branchlets verticillate, nearly equal: leaves often of two forms, either small, ovate, obtusely pointed and appressed to the stems, or larger, ovate-lanceolate, acute, erect and open or secund; costa excurrent into a short bristly point; perichætial leaves linear-lanceolate, plicate at the base, all serrate, papillose, glaucous-green and opaque: male flowers broadly discoid; inner perigonial leaves ovate, lanceolate, spreading above the erect concave base, blunt or subacute, densely serrate: capsule on a long solid slightly flexuous pedicel, cernuous, ovate-globose, of thick texture, striate, longer oblong and ribbed when old; lid convex-conical, acute; teeth purple, lanceolate; cilia two, as long as the segments. — Bryol. Univ. ii. 18. *Mnium fontanum*, Linn. Spec. Pl. 1110. *Bartramia fontana*, Swartz, in Schrad. Journ. Bot. ii. 180; Bryol. Eur. t. 324; Sulliv. l. c.

Var. **alpina,** Brid. Plants short, densely foliate: leaves shorter, ovate-lanceolate: capsule shorter pedicelled.

Var. **falcata,** Brid. Branches curved at top: leaves longer, falcate; costa thick, light brown.

Hab. On the borders of springs and rivulets, and on moist rocks; very common. The first variety on high mountains, the second near springs in valleys and on mountains; not common.

4. **P. calcarea,** Schimp. Much like the last, differing in its thicker wider bright green tufts and more robust stems; leaves larger, crowded, secund or falcate-secund, ovate-lanceolate, those of the male branches often smaller and imbricate, all loosely areolate with a stouter costa, the perigonium large and open, and the involucral leaves long-lanceolate from an en-

larged base, acute, the costa projecting on the upper face: capsule on a very long subflexuous pedicel, oval-globose or exactly spherical, oblong, curved and closely furrowed when dry; teeth shorter, more distantly articulate, and the cilia nearly half as long as the segments. — Coroll. 86. *Bartramia calcarea*, Bruch & Schimp. Bryol. Eur. t. 325; Muell. Syn. i. 475.

Hab. Calcareous springs, hills and mountains; rare. White Mountains (*Oakes*); Humboldt Mountains, Nevada, and in the Uintas (*Watson*).

The habitat of this species in North America is still uncertain. The specimens that were determined and distributed under this name in Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. (ed. 2), n. 250, have been considered by Schimper as a marked variety of *P. fontana*, or as an intermediate form.

5. **P. Mohriana.** Dicœcious: the stems short and stout, densely foliate, radiculose below; branches thick, unequal, generally short, strict: stem-leaves also very strict, open in a dry or humid state, dirty yellow, broadly and exactly lanceolate, long-acuminate, indistinctly plicate lengthwise, irregularly concave at base; borders narrowly revolute, densely serrulate-denticulate at the apex, nodulose in the lower part by projecting papillæ; costa deeply canaliculate, excurrent into an awn-like point; cells of the areolation long, narrow, linear-punctate, papillose; perichætial leaves similar, broader at base, loosely reticulate: capsule on a flexuous stout red pedicel as long as the stem, slightly oblique, larger, globose, plicate; lid minute, umbonate; peristome double, normal. — *Bartramia Mohriana*, Muell., Regensb. Flora, lvi. 482 (1873).

Hab. Decayed trunks in deep woods; Louisiana (*Mohr*).

Differing from *P. fontana* and *P. calcarea* in its short stature, and the leaves very strict, lanceolate, loosely reticulate and very papillose. Dr. Mohr remarks in a letter that the species is very near *P. Schlumbergeri*, a Mexican species, and that he is in doubt of its being North American, having failed to find it again in Louisiana.

Tribe XII. MEESIEÆ.

Plants varying in size, simple or branching by innovations, radiculose-tomentose. Leaves 3–8-ranked, lanceolate or linear-oblong. Calyptra fugacious. Capsule long-pedicellate and long-necked. Lid small, convex or conical. Peristome double; teeth of the outer much shorter than the carinate-plicate inner membrane (absent in *Catoscopium*), which is divided into 16

segments, sometimes partly cohering by the lacerate borders; cilia none or rudimentary.

78. CATOSCOPIUM, Brid.

Plants slender. Leaves open, erect, lanceolate, acutely acuminate with a strong percurrent costa; perichætial leaves longer, half-sheathing to the middle; areolation small, quadrate-oblong or rectangular, opaque. Flowers dicœcious, the male gemmiform. Calyptra long, narrowly cucullate. Capsule small, globose, thick, dark brown, black when old, polished, narrowed by its short collum to the twisted pedicel (1 or 2 c.m. long). Lid short, conical, obtuse. Peristome simple; teeth short, irregular, punctulate. Annulus none.

1. **C. nigritum,** Brid. The only species, with the characters of the genus. — Bryol. Univ. i. 368, t. 4; Bryol. Eur. t. 313. *Weisia nigrita,* Hedw. Musc. Frond. iii. 97, t. 39.

Hab. Lake Superior, in boggy meadows (*Agassiz*); Lake Huron, Ontario (*Macoun*).

A very rare species in North America, easily known by its small globose blackish capsules, resembling pinheads. The genus, though abnormal in its characters, is more nearly related to the *Meesieæ* than to any other group of mosses.

79. AMBLYODON, Beauv.

Plants short. Leaves remote, few, the upper tufted, all thin, soft, very loosely areolate. Flowers bisexual and unisexual on the same plants, the male with few or no archegonia. Capsule thin, stomatose. Lid narrowly conical. Teeth half as long as the narrow segments; cilia none.

1. **A. dealbatus,** Beauv. Leaves oblong-ovate and lingulate-lanceolate, the comal only minutely serrate toward the acuminate apex, whitish when old, twisted when dry; costa dirty brown, vanishing below the apex: capsule soft, long-pyriform, turgid and attenuated to a long neck, which is abruptly narrowed to a long fleshy pedicel, twisted to the left when dry: spores large. — Prodr. 41; Bryol. Eur. t. 307. *Bryum dealbatum,* Dicks. Crypt. Fasc. ii. 8, t. 5. *Meesia*

dealbata, Hedw. Spec. Musc. 174, t. 41. *Meesia Macounii*, Aust. Bull. Torr. Club, v. 22.

Hab. Borders of rivulets in peat bogs; Milwaukie (*Lesquereux, Lapham*); Colorado (*Rothrock, Wolf*); clay ground around boiling springs, Peace River country (*Macoun*).

An examination of the specimens described as *Meesia Macounii* proves them to be evidently ordinary *Amblyodon dealbatus*. Though the medial nerve is said to extend into the apex it is found in all the leaves to vanish below it, as in the normal form. The specimens are in a poor state of preservation, but are identifiable.

80. MEESIA, Hedw. (Pl. 3.)

Stems long, densely cespitose, with few branches; innovations from under the flowers. Leaves long, linear, narrowly lanceolate; meshes of the areolation small, rectangular-hexagonal, chlorophyllose. Flowers bisexual, monœcious or diœcious, the male discoid with clavate paraphyses. Calyptra cucullate, fugacious. Capsule cernuous from the erect collum, clavate, thick-walled, with a small orifice. Annulus simple or none.

1. **M. uliginosa**, Hedw. Synœcious: in dense short tufts, green above, entangled in a felt of brown radicles: leaves 8-ranked, gradually longer upward, the comal long-linear, all blunt or obtuse, the borders entire and revolute; costa thick, vanishing below the apex: capsule incurved, narrowly pyriform, chestnut-color; lid conical-umbonate; peristome orange; annulus simple. — Musc. Frond. i. 1, t. 1; Bryol. Eur. t. 308. *Amblyodum uliginosum*, Beauv. Prodr. 41.

Var. **alpina**, Bruch & Schimp. More densely tufted: leaves strict or turned to one side: capsule and pedicel shorter. — *M. alpina*, Funck.

Var. **minor**, Bruch & Schimp. Plants short: leaves erect, short, muticous: capsule short, thick, and short-pedicelled. — *M. minor*, Brid.

Hab. Boggy places and in wet fissures of rocks on mountains; Minnesota, Ontario, etc., not rare; the varieties in the White Mountains.

2. **M. longiseta**, Hedw. Synœcious: stems long, simple: leaves remote, the lower lanceolate, shorter, the upper long-lanceolate, all slightly decurrent, open, crispate when dry; borders plane, very entire; costa vanishing below or within the

acute apex: capsule erect, oblong-pyriform at the collum, cernuous above, very long-pedicelled, pale brown; lid conical-obtuse; teeth of the outer peristome not half as long as the segments; annulus simple. — Musc. Frond. i. 36, t. 21, 22; Bryol. Eur. t. 309.

HAB. Cranberry swamps in Northern Ohio; not rare.

3. **M. Albertinii,** Bruch & Schimp. Monœcious: shorter and more slender than the preceding: leaves carinate, blunt or acute at the apex, the borders reflexed: flowers all unisexual: pedicel and collum shorter; lid umbonate; teeth very short, perforated in the middle or bifid, scarcely one-third as long as the segments; annulus none. — Bryol. Eur. t. 310.

HAB. Swamps near York Factory, British America (*Drummond*).

4. **M. tristicha,** Bruch & Schimp. Dicœcious: plants widely and loosely cespitose, very long, dark green: leaves three-ranked, distant, more crowded toward the apex, half-clasping and decurrent at base, squarrose, carinate, sharply dentate on the borders, the comal longer and narrower: male flowers discoid; perichætium trigonal, composed of six leaves, narrowly acuminate from a very broad base: capsule on a very long pedicel, pyriform, incurved from the long erect collum; lid convex-conical, alveolate; teeth short, unequal, often bifid; segments appendiculate, linear, very long, three times as long as the teeth, dirty yellow: spores small. — Bryol. Eur. t. 311. *Mnium triquetrum*, Linn. Sp. Pl. 1114.

HAB. Peat bogs, generally with *M. longiseta*. Lake Superior (*Agassiz, Porter*); Closter, New Jersey (*Austin*); Washington Terr. (*Lyall*); rare.

81. PALUDELLA, Ehrh.

Plants loosely and widely cespitose: stems simple or dividing by a simple shoot under the apex, tomentose-radiculose. Leaves all equal, close, five-ranked, decurrent, erect to the middle and there abruptly reflexed, acutely carinate, irregularly denticulate toward the apex and radiculose at base; perichætial leaves erect, narrower, flexuous, subvaginate; areolation round-hexagonal, dense. Flowers dicœcious, the male discoid: perigonial leaves broadly ovate, apiculate. Calyptra long, very narrow, fugacious. Capsule long-pedicellate, short-necked, erect or subcernuous, oblong, smooth when dry. Lid convex, short-apicu-

late. Peristome as in *Webera*, the outer teeth as long as the carinate linear segments; cilia none. Annulus double.

1. **P. squarrosa,** Brid. Characters of the genus. — Musc. Recent. Suppl. iii. 72; Bryol. Eur. t. 312. *Bryum squarrosum*, Hedw. Spec. Musc. 186, t. 44.

HAB. Bogs in the Rocky Mountains (*Drummond*); Herkimer County, New York (*Rau*). A very rare and beautiful moss.

TRIBE XIII. BRYEÆ.

Plants varying in size. Stems simple, branching by innovations, more or less radiculose. Leaves costate, often dentate; areolation nearly uniform, parenchymatose in the whole lamina or prosenchymatose toward the apex, generally smooth. Male flowers gemmiform or discoid. Calyptra cucullate, smooth. Capsule globose or ovate or pyriform, cernuous or horizontal or pendent, rarely erect, with a distinct stomatose collum, long-pedicellate. Lid mamillate, rarely rostrate. Peristome rarely absent or simple, generally double and large; outer teeth transversely barred, marked externally and lengthwise by a medial line, the inner formed by the keeled lanceolate segments of the basilar membrane, alternating with the outer teeth, sometimes adherent to them, separated or not by one to three filiform cilia, either nodose or appendiculate.

82. MIELICHHOFERIA, Hornsch.

Flowers lateral at or above the base of the stem or of the annual innovations. Leaves lanceolate, shining, serrate; areolation narrowly hexagonal-rhomboidal or linear, uniform. Male flowers gemmiform or the antheridia in the axils of perichætial leaves. Calyptra cuculliform, very small and fugacious. Peristome simple, of 16 narrow distantly trabeculate teeth proceeding from an internal carinately 16-plicate membrane. Annulus large.

1. **M. nitida,** Nees & Hornsch. Dicœcious: plants in compact tufts; stems divided into fastigiate slender filiform innova-

tions: leaves small, erect, imbricate when dry, lanceolate, costate to near the sharply serrate apex: capsule pyriform or oval, with a long collum, symmetrical, erect or oblique; pedicel slender, flexuous; lid short-conical, obtuse; peristome simple; teeth narrowly linear, with nodose articulations, yellowish; annulus compound, revoluble. — Bryol. Germ. ii. 183, t. 41; Bryol. Eur. t. 328. *Weisia Mielichhoferi*, Hook. Musc. Exot. t. 10.

Var. **macrocarpa**, Muell. Leaves more obtuse: innovations clavate and more densely foliate. — Syn. i. 235. *Weisia macrocarpa*, Drumm. Musc. Amer. n. 74.

HAB. Rocky Mountains (*Drummond*).

83. LEPTOBRYUM, Schimp.

Plants slender, radiculose at base. Leaves narrow, flexuous, subulate, glossy; areolation (as in *Webera*) linear-rhomboidal above, the lower looser, rectangular-hexagonal. Flowers bisexual. Calyptra very small. Capsule inclined or pendent. Lid mamillate. Peristome double; articulations of the intermediate cilia appendiculate. Sporangium smaller than in *Bryum*.

1. **L. pyriforme**, Schimp. Plants loosely cespitose, soft, green, glossy; stem short: lower leaves distant, narrowly lanceolate, the upper tufted, much longer, lanceolate-subulate, more or less serrate toward the apex; basilar areolation somewhat broader than the upper; costa excurrent: capsule oval-globose, long-necked, yellowish brown, glossy; pedicel long and slender; lid apiculate from a conical base; annulus large. — Coroll. 64. *Mnium pyriforme*, Linn. Sp. Pl. 1112. *Bryum pyriforme*, Hedw.; Bryol. Eur. t. 355; Sulliv. Mosses of U. States, 44. *Webera pyriformis*, Hedw. Musc. Frond. i. 5, t. 3.

HAB. On sandy shaded ground, burnt and decaying trees, etc.; very common.

84. WEBERA, Hedw.

Stems slender. Leaves lanceolate, glossy; areolation rhomboidal-hexagonal, narrow, more or less linear.

The areolation of the glossy leaves and a more slender costa are the essential characters separating this genus from *Bryum*.

Subgenus I. POHLIA.

Lower leaves small, distant, the upper much longer, tufted. Capsule long-necked, cernuous or horizontal. Inner membrane narrow, with the segments entire, and cilia none or very short.

* *Flowers monœcious, the male gemmiform and terminal.*

1. **W. acuminata,** Schimp. Lower leaves erect, the upper linear-lanceolate, irregularly dentate at the apex; borders reflexed toward the base; costa vanishing under the apex or excurrent: capsule narrowly elliptical, on a long pedicel curved in the upper part; lid long-conical, acute or subrostellate, reddish at the base; peristome large; segments long and narrow, entire; cilia none. — Coroll. 64, and Syn. 330. *Pohlia acuminata*, Hoppe & Hornsch., Regensb. Flora, ii. 1. 94. *Bryum acuminatum*, Bruch & Schimp. Bryol. Eur. t. 343.

Hab. Adirondack Mountains, near North Elba (*Lesquereux*); Wisconsin (*Lapham*); Colorado (*Rothrock, Wolf*); Rocky Mountains (*Drummond, Hall*).

* * *Antheridia hypogynous, axillary.*

2. **W. polymorpha,** Schimp. l. c. Loosely cespitose: comal leaves open, lanceolate from an oblong base, sharply serrate toward the point; borders reflexed at base; costa vanishing below the apex: capsule oval-oblong, short-necked, horizontal or inclined, constricted under the orifice after the dehiscence of the conical obtuse or mamillate lid; pedicel straight or flexuous; inner peristome without cilia. — *Pohlia polymorpha*, Hoppe & Hornsch. l. c. 100. *Bryum polymorphum*, Bruch & Schimp. Bryol. Eur. t. 344.

Hab. Oregon (*Hall*); Mount Dana, California (*Bolander*); Sitka (*Bischoff*).

This species is subject to many varieties, like the last, from which it differs in its smaller less solid ovate-lanceolate (not linear) leaves, more distinctly serrate, the areolation shorter, and broader at the base, the costa not as thick, the capsule shorter, narrowed under the orifice when deoperculate, and the lid shorter.

3. **W. elongata,** Schwaegr. Cespitose or gregarious: comal leaves long-lanceolate, open-erect, narrowed and serrate at the apex, recurved in the middle, thin; areolation narrow, nearly linear in the upper part, hexagonal-rectangular below: capsule narrowly elliptical, long-necked, erect, and constricted

under the orifice when deoperculate, often of two colors; pedicel long; lid conical, acute or obliquely rostellate; inner peristome with one or two more or less perfect cilia, or none. — Spec. Musc. 48. *Bryum elongatum*, Dicks. Crypt. Fasc. ii. 8; Bryol. Eur. t. 345; Sulliv. Mosses of U. States, 44. *Pohlia elongata*, Hedw. Musc. Frond. i. 96, t. 36.

Var. **humilis**, Schimp. Stem short: leaves shorter: capsule small, inclined, short-necked, constricted under the orifice when dry, reddish brown; pedicel short.

HAB. Crevices of rocks in mountains; not rare. The variety in Colorado (*Wolf & Rothrock*).

4. **W. longicolla**, Hedw. Plants longer, more densely tufted than in the preceding, yellowish green, matted with brown radicles; stems simple: lower leaves short, squamiform, gradually longer toward the apex, thinner, with a broader areolation; borders sharply serrate from the middle upward; costa narrow, generally vanishing below the apex or percurrent, of a glossy yellow color: capsule oblique or horizontal, oblong-elliptical, shorter and with a shorter regular collum, solid, dark orange; lid convex-conical, uniform in color, sometimes with a short incurved beak; peristome large, yellow, the inner more or less distinctly ciliate. — Spec. Musc. 169, t. 41. *Bryum longicollum*, Swartz, Musc. Suec. 49 and 99, t. 6. *B. elongatum*, var. *alpinum*, Bruch & Schimp. Bryol. Eur. t. 346.

HAB. Cascade Mountains (*Lyall*).

SUBGENUS II. WEBERA, proper.

Leaves broader, more loosely tufted, the comal not as rapidly elongated: capsule thicker, short-necked, inclined or pendent; inner membrane of the peristome broader, and the segments separated by smooth cilia.

* *Flowers monœcious; the antheridia in the axils of comal leaves.*

5. **W. nutans**, Hedw. Cespitose: lower leaves ovate-lanceolate, entire, the upper gradually longer, linear-lanceolate, serrate at the apex; borders flat; costa thick, tenacious, reddish, glossy: capsule oblong-ovate, with a broad orifice, yellowish brown, or darker when old; lid highly convex papillate; teeth dark orange, pale and filiform at the apex; the segments

of the inner peristome pale yellow, split open; cilia 2 or 3, strongly articulate, as long as the teeth; annulus large, revoluble. — Musc. Frond. i. 9, t. 4. *Bryum nutans*, Schreb. Spicil. Fl. Lips. 81; Bryol. Eur. t. 347; Sulliv. l. c.

Var. **cæspitosa**, Schimp. Stems long, branching by innovations from below the apex: leaves longer, slightly flexuous: capsule narrower, horizontal. — Coroll. 66, and Syn. 335.

Var. **bicolor**, Schimp. Comal leaves shorter: capsule thick, long-necked, its upper half darker colored than the lower; pedicel geniculate.

Var. **longiseta**, Schimp. Stems short, simple: comal leaves numerous, large, spreading: capsule pendent upon a long pedicel.

Hab. Moist ground, peat bogs and swamps in the plains, and fissures of rocks in mountains; common. The first and last varieties at Twin Lakes, Colorado (*Wolf & Rothrock*); the second in the White Mountains (*James*); Alaska, etc.

6. **W. cucullata**, Schimp. Densely cespitose; stems simple or sparingly branched: lower leaves and branch-leaves subimbricate, ovate, concave, obtuse, entire, the upper longer, narrowed and serrate at the apex, often cucullate, soft and subopaque: capsule pendent, thickish, pyriform, short-necked, soft, dark brown when old; teeth short and narrow, yellowish; inner segments very thin, pale and narrow, separated by short fugacious cilia. — Coroll. 6, and Syn. 336. *Bryum cucullatum*, Schwaegr. Suppl. i. 2. 94, t. 68; Bryol. Eur. t. 343; Sulliv. Mosses of U. States, 44.

Hab. White Mountains (*Gray, Oakes, James*); Mount Dana, California (*Bolander*).

* * *Flowers dicœcious and bisexual in the same species.*

7. **W. cruda**, Schimp. l. c. Stems long, simple, purple: lower leaves ovate-lanceolate, entire, the upper tufted, flexuous, spreading, long and ribbon-like, distantly serrate at the apex; inner floral leaves shorter, erect, narrowly lanceolate, golden yellow and glossy; costa vanishing below the apex, reddish at base: antheridia of the monœcious plants mixed with the archegonia, in the dicœcious disposed in the axils of the upper subdiscoid perigonial leaves: capsule curved or horizontal, oblong, short-necked, yellowish brown when mature, narrowed at the orifice and ventricose at base when empty; peristome pale

yellow; cilia binate and ternate, perfect. — *Bryum crudum*, Schreb. l. c. 83; Bryol. Eur. t. 348; Sulliv. l. c.

HAB. Fissures of rocks, on mountains; not rare.

* * * *Flowers dicecious.*

8. **W. sphagnicola,** Schimp. Plants solitary or a few together, in tufts of *Sphagnum;* stems dark purple, very long and slender, branching: lower leaves very distant, small, ovate-acuminate, entire, the upper gradually longer and tufting, linear-lanceolate, serrate at the apex, glossy: male plant shorter and smaller; perigonia subdiscoid; antheridia disposed in pairs in the axils of the perigonial leaves: capsule inclined, oblong or obovate, pyriform, pale brown; pedicel very long. — Coroll. 66. *Bryum sphagnicola*, Bruch & Schimp., Bryol. Eur. t. 349.

HAB. In peat bogs of a small valley near the top of Mount Marcy in the Adirondack Mountains (*Lesquereux*).

W. SCHIMPERI, Schimp. (*Bryum Schimperi*, Muell. Syn. i. 334), a species very similar to *W. nutans*, differing merely in its reddish color, smaller leaves with a denser areolation, the diœcious inflorescence, and small peristome, is recorded from Greenland in Schimp. Syn. ed. 2, 400.

9. **W. annotina,** Schwaegr. Loosely cespitose; stems short, simple or emitting from the base slender more or less elongated branchlets, bulbiferous: lower leaves and branch-leaves small, lanceolate, not decurrent, gradually larger and closer upward; comal leaves longer, linear-lanceolate, serrate at the apex, reflexed in the middle, purplish at the solid base; costa strong, percurrent: male flowers thick, many-leaved; antheridia and paraphyses axillary: capsule oval, somewhat long-necked, inclined on a reddish pedicel; teeth yellowish; segments carinate and cleft; cilia perfect. — Spec. Musc. 52. *Bryum annotinum*, Hedw. Spec. Musc. 183, t. 43; Bryol. Eur. t. 353; Sulliv. l. c.

HAB. Mountains of New England (*Oakes, James*).

10. **W. Drummondii.** Plants small, loosely cespitose, radiculose and ferruginous below, greenish above; stems slender, simple or branching by innovations from the apex, purplish below the leaves: stem-leaves small, distant, more densely crowded at the top of the fertile plants, ovate-lanceolate, carinate-concave, sometimes purplish at base; borders slightly reflexed, obscurely denticulate at the apex; costa strong, green, thick and coherent at base, dissolving at the apex: capsule hori-

zontal, oval, turgid, very large in proportion to the size of the plants, with a broad orifice and thick texture; lid small, hemispherical, obtuse; outer teeth robust, yellow; cilia short. — *Bryum Drummondii*, Muell. Bot. Zeit. xx. 328. *B. nutans*, var. *minor*, Drumm. Musc. Amer. n. 263.

HAB. Rocky Mountains (*Drummond*); Sitka (*Harrington*).

11. **W. nudicaulis.** Plants densely cespitose, brown below, greenish above; stems short, slender, simple or rarely innovated at the apex, naked to the middle or above: stem-leaves distant, very small, broadly ovate, appressed; the comal densely tufted, erect, ovate-lanceolate, acute, with a strong costa dissolving below the apex; borders semi-revolute, obscurely denticulate above: capsule small, obovate, turgid, gradually narrowed into an obsolete collum, not constricted at or below the orifice, of thick texture, fuscous, horizontal or pendent on a short flexuous pedicel (1 c.m. long); lid small, convex-conical, mamillate; inner segments long, narrow, sometimes united at the apex by irregular laciniæ; cilia none. — *Bryum nudicaule*, Lesq., Mem. Cal. Acad. i. 21; Sulliv. Icon. Musc. Suppl. 49, t. 34.

HAB. Mount Dana, California, at 11,000 feet altitude (*Bolander*).

Closely allied to the last, and perhaps a variety of it.

12. **W. Bolanderi.** Plants in flat loose tufts, yellowish green; stems simple, foliate: lower leaves erect, loosely imbricate, lanceolate, the upper tufted, close, longer, narrowly lanceolate; costa vanishing below the denticulate apex: male plants slender, the perigonial leaves broadly ovate, concave at base, narrowed into a long flexuous acumen, nearly entire, the perichætial similar: capsule inclined or horizontal, short-ovate, somewhat long-necked; pedicel long, reddish; lid conical, apiculate; outer teeth broad and short; the segments longer, with or without two intermediate rudimentary cilia. — *Bryum Bolanderi*, Lesq., Mem. Calif. Acad. i. 22.

HAB. Foot of Mount Dana, California (*Bolander*).

The longer capsule, of a thinner texture and narrowed at the orifice, its longer pedicel, the shining color of the plants, the narrow strongly denticulate leaves, and the form of the perigonial leaves separate this species from the preceding. No antheridia were found in the axils of the perichætial leaves. It has the appearance of *W. cruda*.

13. **W. commutata**, Schimp. Plants slender, dusky, not reddish: leaves solid, glossy, open-erect, imbricate when dry,

the lower ovate or ovate-lanceolate, shorter; the upper gradually longer, strict, oblong and linear-lanceolate, subcarinate, reflexed on the borders, all scarcely decurrent, more or less serrate at the apex, with a purplish costa enlarged at the base only: male plants generally simple, mixed with the fertile ones, more slender; antheridia axillary, numerous, mixed with numerous slightly clavate paraphyses: capsule inclined or pendent, oval-oblong, incurved at the collum, somewhat turgid; teeth yellow; the inner segments broadly lamellose; cilia two, perfect. —Syn. ed. 2, 403. *Bryum Ludwigii*, Bruch & Schimp. Bryol. Eur. t. 351. *B. commutatum*, Watson, Bot. Calif. ii. 391.

HAB. Foot of Mount Dana, California (*Bolander*); Rocky Mountains (*Hall*); Cascade Mountains (*Lyall*).

14. **W. Lescuriana.** Small, loosely and irregularly cespitose, rarely gregarious, pale green (not red and glossy); stems 1 or 2 c.m. long, declined: lower leaves distant, smaller, narrowly lanceolate, the upper gradually closer, erect, long-lanceolate, all obscurely serrate toward the apex, the strong costa dissolved at the point and decurrent at base: male plants smaller; perigonial leaves erect, concave at base, subulate, rigid, the inner much shorter: capsule pendent, pyriform, twisted above and enlarged at the orifice when dry; pedicel subgeniculate at base; lid conical-apiculate or mamillate; teeth linear-lanceolate, subulate, pale yellow; the segments split; cilia solitary; annulus double, revoluble. — *Bryum Lescurianum*, Sulliv. Mem. Amer. Acad. n. ser. iv. 171, Mosses of U. States, 44, and Icon. Musc. 81, t. 50. *B. pulchellum*, Sulliv. Musc. Allegh. n. 101.

HAB. Moist clay banks and wet sandy ground; not rare.

15. **W. carnea,** Schimp. Gregarious or loosely cespitose, pale green: lower leaves small, distant, gradually closer and larger upward, strict, lanceolate, the comal erect, linear-lanceolate, more deeply serrate at the apex; areolation rhomboidal-hexagonal, loose; costa reddish: capsule horizontal, inclined or pendent, oval, soft, thick, fleshy, short-necked, shorter and subhemispherical and with a broad orifice when dry; pedicel reddish, thicker and arcuate above; lid large, broadly convex, papillate or not; peristome large, the teeth solid, orange-colored, and the segments separated by two cilia; annulus none. — Coroll. 67. *Bryum carneum*, Linn. Sp. Pl. 1122; Bryol. Eur. t. 353.

HAB. Gravelly banks of brooks, Canton, Illinois (*Wolf*).

16. **W. pulchella,** Schimp. l. c. Closely allied to the last, differing especially in the reddish color of the more divided shorter stems, the shorter leaves with more compact areolation, the perigonial broader and ovate-lanceolate, and the perichætial distinctly serrate, the capsule longer, with the pedicel erect at base, and the annulus not revoluble but remaining attached to the lid. — *Bryum pulchellum,* Hedw. Musc. Frond. iii. 96, t. 38; Bryol. Eur. t. 352.

HAB. Very rare in North America. Found only in the Cascade Mountains, British Columbia (*Macoun*).

17. **W. Tozeri,** Schimp. l. c. Plants small, loosely cespitose, pale green, soft, mostly simple: lower leaves distant, obovate, acuminate, decurrent at base; costa none in the lowest leaves, decurrent at base and produced to the middle in the upper; upper leaves closer, narrower and longer, the perichætial smallest, entire, bordered by a reddish or dark green margin composed of two or three rows of narrow cells; areolation large, loose, rhomboidal-hexagonal: male plants smaller; perigonium small, ovoid, the inner leaves lingulate, acuminate, red: capsule pendent, on a fleshy pedicel, arcuate at top, ovate, regular, short-necked, soft, passing by age from pale dirty yellow to brown, shorter and slightly constricted under the broad orifice when dry; lid comparatively large, whitish, convex-conical, mamillate; teeth smaller, pale yellow, the inner segments thin and hyaline; annulus compound, detaching by fragments. — *Bryum Tozeri,* Grev. Scott. Crypt. Fl. v., t. 285; Bryol. Eur. t. 353.

HAB. Clayey ground, borders of ditches and roads; Southern California (*Bigelow, Bolander*).

18. **W. albicans,** Schimp. l. c. Tufts soft, glaucous-green: stems simple, 2 to 8 c.m. long or more, erect or inclined below, reddish or dark purple: lower leaves ovate, oblong, acuminate, the upper oblong-lanceolate, soft, yellowish or pale green; costa vanishing below the serrate apex; areolation narrowly hexagonal-rhomboidal: male plants simple or sometimes branching from under the flower-bearing apex; male flowers discoid; external perigonial leaves broad and concave at base, open and lanceolate above, the inner gradually smaller, bearing many antheridia and paraphyses in the axils: capsule inclined or pendent, short-pyriform, inflated at the short collum, glau-

cous-green, becoming brown by age, small in proportion to the size of the plants, subglobose and truncate or turbinate and wide-mouthed when empty; pedicel long, generally reddish and geniculate at base: teeth of the large peristome orange-colored; annulus none. — *Mnium albicans*, Wahl. Fl. Lapp. 353. *Bryum Wahlenbergii*, Schwaegr. Suppl. i. 2. 92, t. 70; Bryol. Eur. t. 354; Sulliv. Mosses of U. States, 45.

Var. **nigricans.** Plants short, dirty black, in more compact tufts: leaves longer, narrower; areolation pellucid.

HAB. Wet sand, borders of springs and rivulets. The variety on perpendicular limestone rocks, California (*Bolander*).

19. **W. Bigelovii.** Plants long and slender, loosely cespitose, repeatedly branching by innovations, ramulose from the apex: lower leaves on the stems and branches small and distant, gradually larger upward, open-erect, oblong-ovate (the comal lanceolate-acuminate), concave, nearly entire or obtusely denticulate and flat on the borders; costa thick, percurrent or vanishing below the apex: male flower terminal, gemmiform or capitate: capsule long-pedicellate, inclined or pendent, pyriform-elliptical; teeth closely articulate, the inner segments split open, separated by three simple smooth cilia. — *Bryum Bigelovii*, Sulliv., Pacif. R. Rep. iv. 187, t. 5.

HAB. Banks of streams above Sonora, at the base of the Sierra Nevada (*Bigelow*).

The peristome is not described by the author. He remarks that the yellowish green foliage, the shorter, more obtuse and nearly entire leaves with close areolation, the less obovate capsule, and the capituliform male flowers separate this species from *W. albicans*, its nearest congener. The species is by this affinity, or by the characters of the peristome, a *Webera*. But the areolation and the form of the leaves seem to refer it to *Bryum*.

85. BRYUM, Dill. (Pl. 4.)

Plants perennial, radiculose. Leaves with a solid round costa, generally excurrent; cells of the areolation rhomboidal-hexagonal, smooth, loose, solid. Flowers bisexual, monœcious or diœcious, the male gemmiform, rarely discoid. Calyptra narrowly cucullate, falling off before the ripening of the capsule. Capsule on a long stout pedicel, pyriform and passing into a solid stomatose collum, regular or rarely slightly incurved, coriaceous. Lid convex, papillate. Peristome double;

the outer of long linear or lanceolate teeth, closely articulate below, lamellate inside; the inner a carinate membrane ascending to the middle of the outer teeth and there divided into segments, which are adherent to the teeth or free, and separated by two or three generally appendiculate cilia. Annulus generally large, compound, revoluble.

Subgenus I. CLADODIUM.

Cilia and segments of the internal membrane adhering to the teeth (*Ptychostomum*), or free and with imperfect or rarely perfect inappendiculate cilia (*Cladodium*).

* *Flowers bisexual and polygamous.*

1. **B. arcticum,** Bruch & Schimp. Plants in pulvinate purplish tufts: lower leaves ovate-lanceolate, the upper oblong-ovate, all acuminate, bordered with a brown revolute margin, decurrent at base; costa excurrent, slightly denticulate at the apex: capsule pendent, soft, pyriform-clavate, slightly incurved, pale yellow, reddish at the orifice; lid small, conical, mamillate, yellow; peristome small; cilia 2, short: spores large, verruculose, yellowish green; annulus large, revoluble. — Bryol. Eur. t. 335. *Pohlia arctica*, R. Brown, App. Parry's Voy. Suppl. 296; Schwaegr. Suppl. iii., t. 272ª.

Hab. Melville Island (*Parry*); summit of the Rocky Mountains, British America (*Drummond, Bourgeau*); foot of Mount Dana, California (*Bolander*).

2. **B. purpurascens,** Bruch & Schimp. Resembles the preceding, differing in its wide tufts, longer stems, reddish leaves with narrower scarcely revolute borders, and mucronate or cuspidate by the percurrent smooth costa, the narrower capsule more regular, constricted under the orifice when dry, the larger lid and smaller smooth spores. — Bryol. Eur. t. 336. *Pohlia purpurascens*, R. Brown. l. c. 297. *P. arctica*, var. *purpurascens*, Schwaegr. Suppl. iii., t. 272ᵇ.

Hab. Melville Island (*Parry*); Rocky Mountains (*Bourgeau*, according to *Mitten*) and Rainy Lake, British America (*Hubbard*).

3. **B. Brownii,** Bruch & Schimp. Plants densely cespitose and tomentose, green above: leaves narrowly ovate-lanceolate, reflexed on the very narrowly margined borders, slightly den-

ticulate above along the excurrent costa and below it; costa less decurrent at base than in the two preceding species; branch-leaves narrower, not margined; areolation hexagonal-rectangular: male and female flowers separate, but adjacent upon the same innovations: capsule pendent, oblong-pyriform, regular; lid large, convex-apiculate, orange-colored; peristome large, the segments split, separated by two long smooth cilia; annulus compound, very large. — Bryol. Eur. t. 338. *Pohlia bryoides*, R. Brown, l. c. 296.

HAB. Melville Island (*Parry*); Rocky Mountains (*Bourgeau*, according to *Mitten*).

The flowers in separate involucral leaves, the leaves narrower, slightly serrulate at the apex and very narrowly margined, the parenchymatose (hexagonal-rectangular) areolation, the longer narrower capsule, and the very large annulus separate this species from the two preceding. The spores are large and verruculose.

4. **B. pendulum,** Schimp. Plants densely cespitose and ramose: comal leaves close, erect-spreading, ovate-lanceolate, long-cuspidate by the excurrent costa, smooth or dentate at the apex, carinate-concave, more or less reflexed on the narrowly margined borders, rigid; areolation rhomboidal in the upper part, rectangular and reddish toward the base: male flowers few, bisexual, gemmiform; antheridia and paraphyses very numerous: capsule inclined, nearly horizontal or pendent on a flexuous pedicel, oval or subglobose, with a short inflated collum; lid small, conical-apiculate, long-persistent; inner peristome adhering to the outer teeth; segments and cilia detached only in fragments; annulus large: spores smooth, yellow. — Coroll. 70, and Syn. 349. *Ptychostomum pendulum*, Hornsch. *Bryum cernuum*, Bruch & Schimp. Bryol. Eur. t. 331; Sulliv. Mosses of U. States, 45.

HAB. On the ground, rocks and decayed trunks; plains and mountains.

Very variable in the length and ramification of the stems, the form of the more or less elongated capsule, generally pendent but often inclined, etc. Easily confounded with *B. cæspiticium*, from which it is readily distinguished by its narrow-mouthed capsule and its acutely apiculate lid. It also resembles the next species.

5. **B. inclinatum,** Bruch & Schimp. Differs from the preceding in the leaves more revolute and more broadly margined, acutely carinate toward the apex, the reddish brown costa, the flowers generally bisexual, the much longer slender pedicel of the capsule, its longer collum, the convex shorter-

papillate lid, and the inner peristome free above, the segments of the membrane being long, carinate and split, the intermediate cilia merely rudimentary. — Bryol. Eur. t. 334. *Pohlia inclinata*, Swartz, Musc. Suec. 45 and 96, t. 5, fig. 11.

HAB. Stones, rocks and decayed trunks; plains and mountains. Common on the Pacific slope; rare in the East.

6. **B. Warneum,** Bland. Cespitose; stems radiculose, short, simple or sparingly branched; innovations on short round or flagelliform branchlets: stem-leaves distant, open, ovate or oblong-lanceolate, short-cuspidate by the excurrent slightly serrate costa; borders narrowly margined, reflexed below, flat in the upper part; comal leaves numerous, loosely imbricate: flowers monœcious, rarely bisexual; male flowers terminal; antheridia with few paraphyses: capsule long-pedicelled, abruptly pendent, ovate and subglobose-pyriform, solid, brown; lid mamillate, persistent; teeth solid, orange-colored below; segments free, narrow, scarcely split; cilia none or rudimentary; annulus compound. — Brid. Bryol. Univ. i. 675; Bryol. Eur. t. 340.

HAB. Foot of Mount Dana, California (*Bolander*).

American specimens are found to differ slightly from European. The tufts are generally compact, the segments of the inner peristome are more or less split open, and the cilia either none or rudimentary or some of them long and appendiculate; the leaves also are less distinctly denticulate at the apex, and bordered by a distinct margin formed of 2 or 3 rows of long narrow cells. This form appears to be a transition to the next.

7. **B. Biddlecomiæ,** Aust. Differs from *B. Warneum* in the leaves being very distinctly margined, revolute on the borders and very obscurely serrate at the apex, and the capsule larger, with muticous or minutely papillose lid: stems rather short, branching by innovations, often flagelliform as in *B. Warneum:* leaves cuspidate by the stout excurrent costa: capsule constricted under the mouth, pale, becoming light fuscous; the lid rather large. — Coult. Bot. Gaz. ii. 110.

HAB. Colorado (*Miss H. J. Biddlecome*).

From an examination of specimens communicated by the author the essential differences are in the form of the capsule, which is less inflated, less distinctly pyriform, and broad-mouthed, and in the more distinctly revolute borders of the leaves.

8. **B. lacustre,** Brid. Widely cespitose; stems short, radiculose, with longer branches: leaves solid, chlorophyllose, the lower distant and small, broadly ovate-acuminate, the

upper large, open, tufted, broadly oblong-acuminate, carinate-concave, with borders reflexed; areolation large, hexagonal; costa strong, brownish, vanishing below or within the very entire apex: vaginule covered with paraphyses; flowers bisexual: capsule on a slender more or less elongated flexuous pedicel, inclined or subpendent, oblong-pyriform, slightly incurved, soft; peristome short, as in *B. Warneum*. — Musc. Recent. Suppl. iv. 120; Bryol. Eur. t. 332.

HAB. Peninsula of Shumagin, Alaska (*Harrington*).

9. **B. flexuosum,** Aust. Plants loosely cespitose; stem dividing by short innovations, erect: leaves pale red, erect, ovate, subconcave, acuminate, plane or recurved on the very entire borders; costa strong, percurrent or excurrent: flowers diœcious (?); male flowers terminal, large, discoid: capsule on a long slender flexuous red pedicel, ovate-oblong, pale, subhorizontal; lid large, depressed-conical, minutely mamillate; inner peristome adhering to the teeth; cilia none. — Coult. Bot. Gaz. iv. 152.

HAB. Gravelly ground, Blackwater River, British Columbia (*Macoun*).

Apparently nearly related to the last, if not a variety of it; differing only in the inflorescence, which appears to be diœcious. The short reddish stems, and the long flexuous pedicel, which the author indicates as distinctive characters, are those of *B. lacustre*.

10. **B. calophyllum,** R. Brown. Plants gregarious or subcespitose: stem-leaves distant, round-ovate, obtuse, the upper closer, loosely imbricated in loose obtuse gemmules, the lower broadly ovate or oval-oblong, narrowed into a short blunt point, all fleshy, very concave and entire, with the border plane or slightly recurved, not margined; costa vanishing below the apex; perichætial leaves smaller and narrower, the inner lanceolate: male flowers gemmiform at the base of the female: capsule pyriform, short-necked, slightly contracted under the orifice when dry, abruptly pendent on a long strict rigid pedicel; segments of the inner membrane yellow, narrow and split; cilia none or solitary and rudimentary: spores large, green, smooth. — App. Parry's Voy. Suppl. 296. *B. latifolium,* Bruch & Schimp. Bryol. Eur., t. 339.

HAB. Melville Island (*Parry*); Franconia Mountains (*James*); Santa Barbara, California (*W. L. Foster*).

11. **B. uliginosum,** Bruch & Schimp. Stem densely radiculose, branching into short innovations: lower leaves short,

ovate-acuminate, the comal oblong-ovate, lanceolate, cuspidate by the excurrent costa, bordered by a brown margin, reflexed from the base to the middle, plane, and obscurely serrate at the apex, soft, dirty green: male flower close to the female: capsule horizontal or inclined on a long pedicel curving near the apex, long-necked, pyriform, more or less incurved, microstome, yellowish brown, darker when old; lid oblique, small, convex and mamillate, orange; segments split; cilia rudimentary or none; annulus broad: spores minute, verruculose. — Bryol. Eur. t. 339.

HAB. On decayed trunks, in wet places; plains and mountains, from the Atlantic to the Pacific; rare.

A variety with hermaphrodite flowers has been found near Twin Lakes, Colorado, by *Wolf & Rothrock*.

SUBGENUS II. BRYUM, proper.

Capsule inclined or pendent, ovate and oblong-pyriform, rarely slightly incurved. Inner peristome free; membrane large; segments long, perfect, separated by 2 to 4 cilia appendiculate at the articulations.

* *Flowers bisexual, rarely polygamous.*

12. **B. intermedium**, Brid. Plants widely cespitose, green, closely matted with radicles; stems short, dividing into short innovations: upper leaves oblong-ovate, lanceolate, the lower shorter; costa stout, reddish, excurrent into a long remotely denticulate point; borders very entire, reflexed or revolute: capsule horizontal or inclined or pendent, oblong or pyriform, its collum as long as the sporangium, slightly incurved, scarcely narrowed under the orifice when dry; lid convex-conical, apiculate, persistent; cilia 2 or 3; annulus separating in fragments. — Musc. Recent. Suppl. iv. 120; Bryol. Eur. t. 356. *Webera intermedia*, Schwaegr. Suppl. i. 267, t. 75.

HAB. Crevices of rocks and walls, exposed to the south; not rare.

13. **B. cirrhatum**, Hoppe & Hornsch. Plants cespitose, short and robust, with slender and long branches; inner tomentum dark brown: inner leaves ovate-lanceolate, the comal close, numerous, long-lanceolate, acuminate, those of the branches ovate-acuminate, all broadly margined and revolute on the borders; costa stout, fuscous, excurrent into a long distantly denticulate or smooth point: capsule pendent, obovate or ob-

conical-pyriform, regular, constricted under the orifice when dry; lid large, convex, apiculate; segments split; cilia long, 2 or 3; annulus large, revoluble, punctulate. — Regensb. Flora, ii. 90; Bryol. Eur. t. 357.

HAB. Swampy ground, in mountains; Big Tree Grove, and on Mono Pass, California (*Bolander, Ames*); Colorado (*Rothrock & Wolf*).

14. **B. bimum,** Schreb. Plants loosely cespitose, matted together by a felt of reddish radicles: leaves half-clasping, decurrent, open, the outer comal ones elliptical, short-acuminate, the upper or medial oblong-lanceolate, cuspidate by the excurrent fuscous or purple costa, bordered by a broad revolute margin, slightly serrate at the apex, loosely imbricate and twisted when dry: capsule pendent, obovate or oblong-pyriform, slightly constricted under the orifice when dry, chestnut-colored or dark brown; lid broad, convex-mamillate; inner peristome as in the last species: spores green, minute, punctulate. — Spicil. Fl. Lips. 83; Bryol. Eur. t. 363.

HAB. Swamps, decayed trunks, roots of trees near water, etc.; very common on the Eastern slope; Nevada (*Watson*); Washington Territory (*Lyall*).

Resembling the last species in the form and consistence of the capsule, it differs especially in the longer-acuminate and long-cuspidate leaves, and in the spores one-third larger. From *B. pseudotriquetrum*, with which it has been confounded by some authors, it differs in its bisexual inflorescence, the slender stems generally shorter, the leaves less solid and cuspidate, the capsule shorter, and lid not as highly convex. Schimper remarks that *B. cirrhatum*, *B. bimum*, and *B. cuspidatum* are separated by characters of so little importance that they should perhaps be united into one species.

15. **B. lonchocaulon,** Muell. Synœcious: stems long, slender, flexuous, nearly simple, yellowish green, radiculose: lower leaves distant, the upper close, appressed to the julaceous stem, narrowly decurrent at base, ovate-lanceolate, concave; borders revolute to the apex, slightly denticulate at the apex only, not margined; costa stout, reddish below, excurrent into a long slender scarcely denticulate awn; cells of the areolation small, pellucid, empty, irregularly rhomboidal, looser and often reddish toward the base; perichætial leaves similar: capsule on a long purple pedicel, oval, small; cilia two, strongly appendiculate; lid not seen. — Regensb. Flora (1875), lviii. 93.

HAB. Colorado.

Resembles slender forms of *B. bimum*, but is distinguishable at once by the immarginate leaves.

16. **B. torquescens,** Bruch & Schimp. Plants short, loosely cespitose; stems radiculose, simple or fastigiately ramulose: stem- and branch-leaves distant, long-lanceolate, complicate-carinate, recurved or reflexed on the borders, the comal close, oblong-lanceolate, concave, all entire, surrounded by a narrow border; costa reddish, excurrent into a smooth sharp point, twisted to the left when dry: capsule inclined and pendent, long-obconical, blood-red or reddish brown, solid; lid highly convex, acutely mamillate, dark purple, shining. — Bryol. Eur. t. 358.

Hab. Dry rocky or gravelly places, Texas (*Wright*); Oakland, California (*Bigelow*); Nevada (*Watson*); etc.

17. **B. provinciale,** Philib. Loosely cespitose; stems short, divided by few innovations, radiculose at base: branch-leaves few, distant, smaller, ovate-lanceolate, the upper crowded in tufts, spreading when moist, loosely appressed and undulate when dry, ovate-oblong, concave, acuminate or cuspidate by the excurrent stout reddish costa; borders narrowly recurved from the middle to the base, plane, minutely serrate toward the apex; inner or perichætial leaves smaller, lanceolate, longer pointed; borders revolute or broadly reflexed to near the apex: flowers partly bisexual, the fertile always unisexual; vaginule thick, covered with abortive archegonia and paraphyses: capsule oblique or pendent, on a reddish pedicel, obconical-pyriform, brown-orange; lid highly convex, apiculate; teeth yellow up to the middle, hyaline above; segments cleft; cilia long-appendiculate; annulus large, revoluble. — Schimp. Syn. ed. 2, 432. *B. Billarderii*, Bruch. & Schimp. Bryol. Eur. t. 366. *B. Canariense*, Brid.; Schwaegr. Suppl. iii., t. 214^{b}.

Hab. Cañon on Monte Diablo, California (*Bolander*); Florida (*Garber, J. Donnell Smith, Chapman*).

18. **B. Oreganum,** Sulliv. Densely cespitose; stems and innovations very short, gemmiform: leaves crowded into a subglobose tuft, oblong or obovate-oblong, pointed, serrate above; borders margined and reflexed; costa extending to the point; areolation rather loose; perichætial leaves elongated-oblong, long-pointed with a subexcurrent costa; capsule subpendent, on a slender pedicel 3 to 5 c.m. long, clavate, oblong, straight or slightly curved, constricted below the mouth when dry; lid rather small, hemispherical, apiculate; teeth closely articulate; segments broad, cleft; cilia 2, strongly and conspic-

uously appendiculate; annulus large and compound. — Musc. Wilkes Expl. Exp. 10, t. 7.

HAB. Oregon (*Pickering*).

Species closely related to *B. microstegium*, Schimp., but that has ovate-lanceolate leaves, gradually acuminate and long-cuspidate by the excurrent costa, with margins not reflexed, a convex-conical more pointed and smaller lid, and more linear teeth with more distant articulations.

* * *Flowers monœcious.*

19. **B. pallescens,** Schleich. Subcespitose and pulvinate; stems somewhat long, branching, radiculose, purple: lower leaves distant, ovate, acuminate; costa vanishing below the apex; comal leaves crowded into a spreading tuft, oblong-acuminate, apiculate or cuspidate by the excurrent costa, reddish at base, more or less revolute on the entire border: male flowers on separate lateral branches: capsule long-necked, oblong-pyriform, inclined or horizonal, constricted under the orifice when dry; lid bright reddish-brown, conical, apiculate; teeth yellow; segments longer and more acuminate than in the preceding species. — Schwaegr. Suppl. i. 2. 107; Bryol. Eur. t. 359.

HAB. Fissures of sandstone rocks, Ohio to Canada; also in Colorado, Utah, California and Washington Territory.

The stems of this species vary in length and are more or less divided, the leaves either long-cuspidate or abruptly acuminate are always reddish at base, and the capsule varies in the length of its collum; the lid is smaller than that of *B. cæspiticium*, which this species resembles.

20. **B. subrotundum,** Brid. Plants short, gregarious, much divided into short gemmiform innovations: lower leaves small, broadly ovate-acuminate, mucronate by the excurrent costa, the upper abruptly larger, densely crowded into tufts, ovate and oblong-lanceolate, the perichætial lanceolate, all shortly aristate by the excurrent subdenticulate costa, concave, flat on the borders, soft: capsule inclined or pendent, spherical or oblong-pyriform, with a narrow orifice, slightly constricted under it when dry; lid small, conical, mamillate; peristome as in the preceding. — Musc. Recent. Suppl. iii. 29; Muell. Syn. i. 275; Bryol. Eur. t. 361. *B. pallescens*, var. *subrotundum*, Bruch & Schimp. Bryol. Eur. t. 360.

HAB. Mountains of Canada (*Drummond*); Yosemite Valley (*Bolander*); Colorado Mountains (*Downie*).

Differs from *B. pallescens* in its concave broader leaves, with a shorter point and the borders not reflexed, the capsule nearly pendent, shorter and broader, the sporangium being nearly round, the orifice small.

* * * *Flowers dicecious.*

+ *Male flowers gemmiform.*

21. **B. erythrocarpum,** Schwaegr. Plants short, simple, or with few branches: leaves erect, distant, open, rigid, ovate-lanceolate or lanceolate, denticulate at the apex or entire, cuspidate by the excurrent costa; borders slightly reflexed: capsule inclined or pendent, oblong or obconical, pyriform, blood-red; lid highly convex, apiculate; teeth pale, ferruginous; segments whitish yellow. — Suppl. i. 2. 100, t. 70; Bryol. Eur. t. 376. *B. sanguineum*, Brid. Musc. Recent. Suppl. iii. 28; Sulliv. Mosses of U. States, 46.

Hab. Mountains of Northern Alabama (*Lesquereux*); rare.

22. **B. atropurpureum,** Wahl. Loosely cespitose; stems radiculose up to the base of the fertile tufts: lower leaves distant, ovate-lanceolate, the upper crowded, tufting, much longer, ovate-acuminate, apiculate by the excurrent costa, concave, very entire; borders reflexed toward the base; areolation loose: male plants slender: capsule turgid at the rugulose collum, broadly oval, blood-red or dark purple when old; pedicel flexuous, arched above; lid enlarging above the orifice of the capsule, hemispherical and apiculate, bright red and shining; teeth reddish at base; segments yellowish. — Web. & Mohr, Ind. Musc. 360; Bryol. Eur. t. 378. *B. erythrocarpon*, Brid. l. c. iii. 18.

Hab. Sandy soil; Lookout Mountain, Alabama (*Lesquereux*); Buffalo, New York (*G. W. Clinton*); Pennsylvania (*James*); Illinois (*Hall*); Nevada (*Watson*).

23. **B. coronatum,** Schwaegr. Loosely tufted, tomentose within, bright green on the surface; branches slender, soft, loosely foliate: leaves erect-spreading, oblong-lanceolate, mucronate or long-cuspidate by the excurrent thin costa; borders flat, entire; perichætial leaves enlarged at base, abruptly lanceolate: capsule pendent and torulose, rugulose at base; lid large, conical or highly convex-apiculate, thick on the borders, purple, shining. — Suppl. i. 2. 103, t. 71; Muell. Syn. i. 307.

Hab. Florida (*D. B. Smith, Garber, J. Donnell Smith*).

The areolation of the leaves is like that of *B. carneum*. The capsule resembles that of the last species, but is thick and fleshy, abrupt and crown-like at the insertion of the pedicel; peristome of the same character. A fine species.

24. **B. versicolor,** Al. Braun. Mode of growth as in *B. atropurpureum;* branches rigid, densely foliate: leaves erect-spreading, ovate-lanceolate, cuspidate by the thick brown excurrent costa; borders entire, slightly revolute: capsule abruptly pendent, on a rigid pedicel, round-oval, with a short hemispherical collum, reddish, much smaller when dry, broad-mouthed when deoperculate, constricted between collum and sporangium; lid large, convex-apiculate. — Bryol. Eur. t. 379.

HAB. Florida (*D. B. Smith*); rare.

25. **B. alpinum,** Linn. Densely and widely cespitose: plants chestnut-colored or purplish brown, shining, robust, short and erect, or long and decumbent below, radiculose at the base only, densely and equally foliate: leaves erect, rigid, lanceolate or oblong-lanceolate; costa stout, purplish, excurrent into a short point, entire or obscurely serrate at the apex; borders reflexed in the middle: capsule pendent, ovate-oblong or obconical-pyriform, its somewhat long collum gradually attenuated into the pedicel, solid, blood-red or dark purple when old, slightly constricted under the orifice; lid mammiform; outer peristome ferruginous: spores yellowish green. — Mant. Alt. 309; Bryol. Eur. t. 380.

HAB. White Mountains (*Oakes, James*).

26. **B. Muhlenbeckii,** Bruch & Schimp. Closely resembles the preceding, differing in the olive-green color of the tufts, the leaves broader, long-elliptical, deeply concave, loosely areolate, more or less obtuse and cucullate at the apex, borders reflexed all around: capsule chestnut-colored, not purplish. — Bryol. Eur. t. 381. *B. Raui,* Aust. in Coult. Bot. Gaz. ii. 110.

HAB. New Mexico (*Palmer*); Belleville, Ontario, Canada (*Macoun*).

27. **B. miniatum,** Lesq. Densely cespitose, yellowish green and purplish; stems radiculose, slender, long and mostly simple or dividing by nearly filiform innovations from under the floral buds: leaves appressed when dry, loosely imbricate, the upper more crowded but not tufted, concave, ovate or ovate-lanceolate, obtuse, scarcely or not at all margined or reflexed on the borders; costa stout, vanishing below the apex; cells polygonal, solid or thick-walled; perichætial leaves slightly longer and narrower: capsule inclined, obovate-oblong, slightly constricted under the orifice when dry, purplish-fawn color; lid convex or conical, apiculate. — Mem. Calif. Acad. i. 23.

HAB. On moist rocks, Yosemite Valley (*Bolander*).

With the appearance of *B. pseudo-triquetrum*, with which it grows mixed, but easily separated by the given characters. It has the ramification of *B. Bigelovii*, Sulliv., from which it differs in its longer capsule and the form of the leaves. The purplish branches are often abruptly crimsoned at the apex, as if painted with carmine.

28. **B. Atwateriæ**, Muell. Closely related to the last, from which it essentially differs in its somewhat more robust stems, the leaves more densely imbricate, scarcely open when moistened, oblong or ovate, obtuse, more distinctly narrowed toward the base, cucullate, with the borders revolute from the base to the middle, and with a thick yellow medial nerve, the areolation more compact, the upper cells smaller, less distant, pellucid, narrowly oblong and angular, the lower more distinct, rectangular along the borders, hexagonal toward the middle: the oblong pendent capsule, slightly contracted under the lid when dry, has the same color and form. — Regensb. Flora, lviii. 76 (1873). *B. Macounii*, Aust. in Coult. Bot. Gaz. ii. 110.

HAB. Rocks near waterfalls; Yosemite Valley, California (*Mrs. Atwater*), sterile; Oregon (*E. Hall*), fruiting plants; British Columbia (*Macoun*).

It is very difficult to find marked and persistent characters separating this from the last species. The Californian plants are long and still more slender than those of *B. miniatum*. The fruiting specimens from Oregon are strong, thick, and very short, while the sterile from British America (described as *B. Macounii*) are as long as those of *B. miniatum*, and also much thicker. The leaves, differing enough in appearance when single specimens are compared, taken altogether have the same characters. In his description of *B. Macounii*, Austin states that the leaves have the borders flat, while in *B. miniatum* they are revolute. This last character is distinct in *B. Atwateriæ*, as described by Mueller, and most of the leaves of *B. Macounii* also have the borders of the leaves as distinctly reflexed or revolute towards the base as in *B. miniatum*. The leaves in all these forms are more or less indistinctly margined. Austin also remarks that *B. miniatum* is too near *B. Muhlenbeckii*, but the Macoun specimens are far more closely allied to this last species in their strong growth than are the slender stems of *B. miniatum*.

29. **B. argenteum**, Linn. Plants more or less densely tufted and irregularly cespitose, greenish or silver white; stems short, radiculose, with numerous julaceous innovations: stem- and branch-leaves broadly ovate or obovate, deeply concave, abruptly apiculate, the comal oblong-lanceolate, acuminate; costa vanishing above the middle; borders entire, plane; areolation loose: capsule pendent, oblong, constricted under the

orifice, reddish brown, blackish when old; lid convex, slightly apiculate, dark orange; inner peristome yellow or hyaline. — Sp. Pl. 1120; Bryol. Eur. t. 384.

Var. **majus**, Schwaegr. More densely cespitose, dividing into numerous longer glaucous-green innovations: leaves slightly obtuse: capsule scarcely rising above the top of the branches. — Suppl. i. 2. 88. *B. julaceum*, Schrader.

Var. **lanatum**, Bruch & Schimp. Branches shorter, thick: top of the leaves white, appearing white-woolly by long flexuous hair-like points without chlorophyll: capsule shorter. — *B. lanatum*, Brid.

HAB. Sandy ground, burnt places, rocks and wood; very common. The first variety in wet shaded places; the last on dry sandy soil exposed to the sun.

30. **B. cæspiticium**, Linn. Plants more or less densely cespitose; tufts yellowish green, ferruginous, tomentose within: leaves erect and straight when dry, the lower distant, small, lanceolate, the upper larger, loosely imbricate, ovate-lanceolate, acuminate by the excurrent costa, all concave; borders entire and reflexed: capsule oblong-pyriform, inclined or pendent, narrowed under the orifice when dry; lid large, mammiform, reddish, polished; teeth ferruginous, broadly lamellose inside; segments cleft, separated by two or three long-appendiculate cilia. — Sp. Pl. 1121; Bryol. Eur. t. 374 and 375.

HAB. Old fields on the ground, stones, old walls, etc.; very common. A very variable species, especially in the leaves and form of the capsule, which is generally capped by a large lid. This with the inflorescence and the perfect peristome separates it from *B. pendulum*.

31. **B. capillare**, Linn. Tufts bright or dirty green, brown-tomentose inside; plants branching by few innovations: leaves soft, twisted when dry, broadly oblong or spatulate, more or less abruptly narrowed into a filiform slightly denticulate often flexuous point, brown-margined and reflexed on the borders; costa vanishing below the apex or excurrent: capsule long-pedicelled, horizontally inclined or pendent, oblong or obconical, gradually narrowed to its collum, which is shorter than the sporangium, fuscous; lid large, mammiform, apiculate, shining. — Sp. Pl. 1121; Schwaegr. Suppl. i. 2. 118, t. 74; Bryol. Eur. t. 368, 369.

HAB. Black soil, roots of trees, and shaded places; mountains and borders of streams.

Upon the form of the leaves, which are extremely variable, the following varieties are based: — Var. *cuspidatum*, Schimp., having leaves with a more or less broad brown margin, the costa stout and percurrent; Var. *meridionale*, Schimp., with the costa excurrent into a long filiform point and the borders narrowly margined; Var. *flaccidum*, Bruch & Schimp., with slender branches, the longer more distant and narrower leaves softer, obsoletely margined, and obscurely serrate at the piliferous apex, generally found in the Eastern States and the White Mountains. A variety with variously colored capsules, mostly dark red, was distributed in Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. (ed. 2), n. 283 and 284, as *B. occidentale*, Sulliv.

32. **B. occidentale**, Sulliv. Loosely cespitose; stems short, tomentose under the crowded tufts of floral leaves; innovations slender and few, thicker in the middle: leaves elliptical or oblong-lanceolate, entire, flat or slightly reflexed on the borders; costa stout, excurrent into a short slightly serrate point; basilar areolation quadrate, the upper narrowly rhomboidal-hexagonal; perichætial leaves slightly narrower: capsule pendent, oblong, short-necked, with a broad orifice; lid convex-apiculate; annulus very broad. The male plants are slender, branching in successive gemmaceous innovations. — Pacif. R. Rep. iv. 188, t. 7.

Hab. Near San Francisco (*Bigelow*).

Separated from the nearly related *B. cæspiticium* by the erect appressed decurrent scarcely margined leaves, not so acuminate nor so long-cuspidate, by the stouter costa, and by the denser areolation composed in the lower half of quadrate cells. It has also an oblong and smaller capsule, with but a slight tendency to a pyriform outline, a wide and reddish lid and a larger annulus. — (*Sullivant.*)

33. **B. obconicum**, Hornsch. Plants short, radiculose up to the innovations: stem-leaves ovate, the comal crowded, open-erect, imbricate or slightly twisted when dry, ovate or oblong, more or less long-cuspidate by the excurrent smooth or slightly denticulate costa, bordered with a yellow margin: capsule pendent, long-obconical, the sporangium gradually narrowed to a collum nearly as long and to the reddish brown pedicel; lid hemispherical, minutely papillate. — Bryol. Eur. t. 367.

Hab. Santa Cruz Mountains, California (*Brewer*); Florida (*D. B. Smith*); Colorado (*Wolf & Rothrock*).

Intermediate between *B. capillare* and *B. cæspiticium*. From the first it differs in its shorter gradually acuminate scarcely twisted and more solid leaves; from the second in the long-necked narrowly obconical capsule, whose orifice has a cartilaginous polished border and a bright red lid. The margins of the leaves are pale yellow, not thickened.

34. **B. Californicum,** Sulliv. Densely cespitose; stems and innovations very short, bulbiform: lower leaves distant, imbricate, the upper densely crowded in small globose heads, concave, subquadrate-ovate, short-apiculate; borders entire and flat; costa continuing to the apex: capsule dark red, oblong, pendent, equal and scarcely narrowed at the collum, which is rugose when dry, obtuse at base; lid very small, hemispherical; teeth bright purple, deeply inserted and distantly articulate; cilia short, solitary, not appendiculate; annulus large, revoluble. — Pacif. R. Rep. iv. 186, t. 6.

HAB. Near Benicia, California (*Bigelow, Bolander*).

As remarked by the author, this species is allied to *B. versicolor*, which however has the pedicel more suddenly bent at the base of the inflated collum, and the leaves longer and long-acuminate by the excurrent costa. From *B. Blindii*, to which it is also related, it differs in its narrower leaves, in the form of the capsule, which is subglobose in the European species, and in the inner peristome.

35. **B. cyclophyllum,** Bruch & Schimp. Plants bright green, soft, loosely cespitose, more or less divided according to size, radiculose near the base at the axils of the leaves: stem-leaves distant, broadly ovate, narrowed to the base, the comal few, broadly oblong, all concave, obtuse, very entire, loosely areolate, twisting when dry; costa vanishing below the apex: male plant similar; perigonium reddish, gemmiform: capsule pendent, short, pyriform, broad-mouthed, constricted under the orifice when dry; peristome regular. — Bryol. Eur. t. 370. *Mnium cyclophyllum*, Schwaegr. Suppl. ii. 2. 160, t. 194.

HAB. On stones wet by spray, at Niagara Falls (*G. W. Clinton*); wet rocks, Pennsylvania (*James*).

This species is often confounded with *B. calophyllum*, from which it differs in its broader softer and more loosely areolate leaves, in the inflorescence, and the regular double peristome of a *Bryum*, the segments being separated by appendiculate cilia.

36. **B. pallens,** Swartz. Tufts short, soft, purplish yellow: lower leaves remote, open or recurved, ovate-lanceolate, acuminate, decurrent at base, the upper close, tufted, oblong-acuminate, and mucronate by the excurrent costa, all surrounded by a narrow margin composed of two rows of cells; borders plane in the upper part, reflexed near the base: male plants more slender: capsule inclined, more rarely pendent, often cernuous or incurved, rarely regular, long-necked and pyriform, soft, yellowish or brown, erect when dry, not constricted under the

orifice; lid mammiform, shining, yellow; teeth closely articulate, ferruginous; segments pale yellow. — Musc. Suec. 47, t. 4; Bryol. Eur. t. 373.

HAB. Wet places on mountains; New Hampshire (*James*); White Face Mountain, in the Adirondacks (*C. H. Peck*).

Variable in the size of the plants, the length of the pedicel, and the form of the capsule.

+ + *Male flowers subdiscoid.*

37. **B. Duvalii,** Voit. In very loose soft purplish green tufts; stems long, erect when young, decumbent when old, slender, as are also the few very long innovations, radiculose at the base only: leaves distant, open or reflexed, nearly equal, broadly ovate-lanceolate, long-decurrent, plane on the entire borders, loosely areolate, much contracted when dry; costa vanishing below the apex; inner perichætial leaves lanceolate, erect: capsule on a long slender pedicel, sometimes longer than the innovations, obovate-oblong, regular, pendent, constricted under the orifice when dry; lid convex, uniform in color. — Sturm, Deutschl. Fl. ii. t.; Bryol. Eur. t. 371.

HAB. Mountains of New England (*Oakes*, etc.); Canada, New Mexico, California, Oregon, etc.; not common.

38. **B. pseudotriquetrum,** Schwaegr. Plants widely cespitose or pulvinate, robust, olive or greenish yellow; stems sparingly branching, tomentose to the apex: leaves gradually larger and more crowded toward the apex, erect or spreading, loosely appressed, incurved or twisted when dry, oblong-lanceolate, gradually acuminate, serrate at the apex, bordered by a narrow yellowish margin becoming broader toward the base and reflexed; costa stout, reddish, percurrent; involucral leaves broadly ovate, acuminate, costate, spreading when moistened: antheridia and paraphyses very numerous: capsule long-pedicellate, inclined, long-obconical or oblong, sometimes curved upward and subventricose, constricted under the orifice when dry; lid highly convex, papillate, uniform in color and shining. — Suppl. i. 2. 110; Bryol. Eur. t. 364. *Mnium triquetrum*, Hedw. Musc. Frond. iii. 19, t. 7.

HAB. Swampy ground, wet rocks, borders of springs; plains and mountains; not rare.

39. **B. turbinatum,** Schwaegr. Plants loosely and widely cespitose, rarely in compact tufts, dirty or reddish green;

stems short, often bearing long slender branches reaching as high as the long slender pedicel: lower leaves ovate-acuminate, concave, the upper gradually larger, tufted, ovate, oblong-lanceolate, obscurely serrate at the apex, with very narrowly margined and reflexed borders, mucronate by a stout reddish excurrent costa: male plants in separate tufts or mixed with the fertile ones, more slender and nearly simple; perigonium thick, subdiscoid, in a tuft of few leaves: capsule long-pedicelled, pendent, broadly pyriform, obconical at its collum, constricted under the broad orifice when dry; lid convex, apiculate, shining. — Suppl. i. 2. 109; Bryol. Eur. t. 372, excl. var. *latifolium*. *Mnium turbinatum*, Hedw. Musc. Frond. iii. 22, t. 8.

Hab. Wet rocks, Niagara Falls; Rocky and Uinta Mountains; Galton Mountains, British Columbia.

40. **B. Schleicheri,** Schwaegr. Closely resembles the last species, differing essentially in the great size of the plants, the leaves twice or thrice larger, bright or yellowish green, more concave, not carinate, with margin narrower, the borders nearly flat, and the areolation loose. — Suppl. i. 2. 113, t. 73. *B. turbinatum*, var. *latifolium*, Bruch & Schimp. Bryol. Eur. t. 372.

Var. **angustatum,** Schimp. Plants shorter, slender, simple: leaves smaller, narrower. — Syn. ed. 2, 463.

Var. **latifolium,** Schimp. l. c. Tufts soft, inflated, green; plants long (4 to 12 c.m.), rarely simple: leaves broadly ovate, rounded-obtuse or oblong-ovate, acuminate, mucronate by the excurrent costa.

Hab. Wet meadows; Bigtree Grove, California (*Bolander*); near Salt Lake City (*Watson*); Var. *angustatum* in the Humboldt Mountains, Nevada (*Watson*).

The species is very variable in all its characters.

Subgenus III. RHODOBRYUM.

Plants fine and large, with a single innovation from under the apex, passing into a stem from the continuation of basilar subterranean stolons. Stem-leaves distant, subsquamiform, the comal crowded, rosulate. Flowers dicœcious, discoid.

41. **B. roseum,** Schreb. Stem-leaves appressed, oblong-lanceolate, small and thin, the comal more solid, spatulate, acuminate, acutely denticulate from the middle upward,

reflexed to the base, crispulate when dry; costa broad and reddish at base, narrowed upward and percurrent; areolation loose, the cells chlorophyllose: male plants generally in separate tufts, the comal leaves shorter and broader, spreading star-like: capsule single or two or three in the same perichætium, pendent on a long solid dark purple pedicel, oblong-conical, slightly incurved, rarely obovate-oblong, not constricted under the orifice when dry, solid; lid mammiform, dark purple; teeth very long; inner membrane orange-colored; segments lacunose along the keel; annulus revoluble. — Spicil. Fl. Lips. 84; Bryol. Eur. t. 365.

HAB. Shaded pine woods, base of trees, on shaded rocks covered with humus; not rare on the Eastern slope. Found also in California by *Bolander*.

The most beautiful species of the genus, like a *Mnium* in appearance, but closely allied to *B. capillare* in its characters.

42. **B. concinnatum,** Spruce. Dicœcious: plants small, cespitose, cohering by radicles below; stem about 2 c.m. long, erect, julaceous, slender, filiform from the base, reddish below, green above: leaves erect-appressed, broadly ovate or oval-lanceolate, carinate-concave, apiculate by the slender subexcurrent costa; borders erect and very entire; upper areolation narrowly rhomboidal, the basilar quadrate. — Muell. Syn. ii. 575.

HAB. Kaaterskill Falls, Catskill Mountains (*C. H. Peck*).

86. ZIERIA, Schimp.

Plants short, cespitulose, branching by innovations under the flowers, then dichotomous. Stems radiculose up to the apex. Leaves soft, more or less densely imbricate, ovate and oblong-acuminate, apiculate or cuspidate by the excurrent costa; areolation broadly hexagonal-rhomboidal. Flowers gemmiform. Capsule horizontal or curved down, short-pedicelled, very long-necked, narrowly elliptical, sporangium inflated. Lid small, convex-apiculate, oblique. Peristome double; the teeth narrowly lanceolate, remotely articulate; inner membrane divided into narrow segments, often united at the apex by transverse divisions, separated by rudimentary cilia.

1. **Z. julacea,** Schimp. Tufts soft and loose, silvery white; stems short, divided into numerous erect branchlets: lower

stem-leaves remote or destroyed by maceration; comal leaves oblong-lanceolate, those of the branchlets densely imbricate, broadly ovate, concave, acuminate; inner costa soft, excurrent; areolation very broad and soft, chlorophyllose at the base only, hyaline above: capsule horizontal or slightly inclined; collum twice as long as the sporangium; lid convex-conical, acute, orange-colored, the capsule being yellowish-brown; teeth orange at base, subulate and whitish at the apex. — Coroll. 68. *Bryum Zierii*, Dicks. Pl. Crypt. i., t. 4, fig. 10; Bryol. Eur. t. 341.

HAB. Near the Height of Land, Rocky Mountains of British America (*Drummond*).

2. **Z. demissa,** Schimp. Tufts dense, reddish brown, densely matted by a felt of radicles: stem-leaves ovate-lanceolate, costa vanishing below the apex; comal leaves oblong-lanceolate, long-cuspidate by the excurrent costa; branch-leaves loosely imbricate: capsule curved down on an arched pedicel, clavate, its collum and sporangium of equal length, yellow, chestnut-colored when old; lid small, mamillate, oblique; teeth lanceolate; segments of the inner membrane twice as long as the teeth, united at the apex and adhering by transverse laciniæ; cilia very short, single or bifid. — Coroll. 69. *Meesia demissa*, Hoppe & Hornsch., Regensb. Flora, ii. 106 (1819). *Bryum demissum*, Hook. Musc. Exot. t. 99; Bryol. Eur. t. 341.

HAB. Fissures of rocks, Twin Lakes, Colorado (*Downie, Rothrock & Wolf, Porter*); very rare.

87. MNIUM, Linn. (Pl. 3.)

Plants larger than in *Bryum*, gregarious, or more generally loosely and widely cespitose. Stems produced from basilar innovations or from subterranean stolons, woody, tomentose, rarely divided and sometimes bearing arcuate creeping flagelliform branchlets. Leaves 3–5-ranked, the lower smaller, distant, the upper much enlarged, crowded and rosulate, broadly ovate or spatulate; costa stout; borders thick, simply or doubly dentate; cells of the areolation very large, round-hexagonal, hexagonal-oblong near the base, rarely chlorophyllose. Flowers bisexual or diœcious; the male discoid; antheridia and clavate paraphyses axillary, very numerous. Calyptra cucullate, narrow.

fugacious. Capsules on long often clustered pedicels, inclined or pendent, ovate-oblong or subglobose, the short collum abruptly narrowing to the pedicel. Lid mammiform or convex-conical, more or less long-beaked. Peristome as in *Bryum*, the inner membrane reaching the middle of the teeth; cilia 2 or 3, not appendiculate at the articulations. Annulus narrow, revoluble. Spores minute. — *Astrophyllum*, Neck.

* *Leaves margined, simply serrate.*

+ *Flowers bisexual.*

1. **M. cuspidatum,** Hedw. Plants simple, with creeping or suberect stolons: leaves decurrent, the lower obovate, the comal obovate-oblong, the perichætial spatulate, those of the stolons round-obovate, all apiculate-mucronate or short-cuspidate by the excurrent costa, margined by a triple row of brown cells and solid yellow teeth: capsule single, subpendent, oval, light brown; lid highly convex, obtuse or papillate; outer peristome yellow, the inner orange, solid; segments broadly open on the keel, filiform and apiculate at the apex; cilia generally three. — Spec. Musc. 192, t. 45, excl. var.; Bryol. Eur. t. 396. *M. silvaticum*, Lindb. Mniac. Eur. in Faun. Flor. Fenn. ix. 59.

Hab. Shaded places on the ground; common.

2. **M. Nevii,** Muell. Plants short, yellowish green above; stems simple, clavate: stem-leaves close, spreading or reflexed when moistened, fleshy, decurrent and narrowly wedge-form at base, enlarged upward and spatulate-ovate or orbiculate, acuminate or aristate by the excurrent costa, with the point more or less flexuous; borders acutely dentate or ciliate; cells of the areolation small, regularly hexagonal, green and chlorophyllose, yellowish on the border; perichætial leaves few, small, lanceolate-acuminate, entire, bordered above only by a narrow margin: capsules aggregated (2 or 3), cylindrical-oblong, enlarged at base; pedicels yellow, flexuous: lid and calyptra not seen. — Regensb. Flora, lvi. 480 (1873).

Hab. Portland, Oregon (*R. D. Nevius*).

The species is allied to *M. cuspidatum*, but is recognized at first sight by its simple clavate stems.

3. **M. venustum,** Mitt. Plants erect, pale green or greenish yellow; stems erect, rigid, simple or once forked, densely foliate

toward the apex: leaves spreading when moist, the comal open, erect, broadly elliptical, acuminate or cuspidate by the excurrent thick costa, sharply dentate on the borders; perichætial leaves cuspidate, the inner narrow, lanceolate: capsules aggregated (3 or 4), long-pedicelled, inclined or pendent, oblong, broad-mouthed, gradually narrowing to the pedicel, papillose and stomatose toward the base; lid obtusely conical or obtusely apiculate; annulus simple, broad. — Kew Journ. Bot. viii. 231 (1856), t. 12, B; Sulliv. Icon. Musc. Suppl. 52, t. 36.

Hab. Pacific coast, from California northward, not rare (*Douglas*, etc.); W. Montana, N. Idaho, and Spokan Falls (*Watson*).

4. **M. medium**, Bruch & Schimp. Plants large, broadly cespitose: lower leaves distant, ovate, cuspidate, the comal obovate-lingulate, narrowed to the half-clasping base, cuspidate, sharply serrate and narrowly margined all around: capsules solitary or in pairs, pendent, oblong; lid highly convex, apiculate. — Bryol. Eur. t. 398.

Hab. Pend d'Oreille Lake in N. Idaho; Fort Colville and Cascade Mountains, Washington Territory; Wasatch Mountains; also the Eastern slope, in New Jersey, New York, and Massachusetts.

Closely resembling *M. affine*, but differing in the inflorescence, the leaves more sharply serrate and less crispate when dry, the capsule longer, with a longer and more acute lid, and the teeth narrower.

5. **M. Drummondii**, Bruch & Schimp. Plants loosely cespitose: leaves open, reflexed, decurrent at base, the lower small, distant, elliptical-obovate, the comal gradually larger, crowded, obovate-lanceolate; outer perichætial leaves oblong, spatulate, the inner very small and lanceolate, all mucronate-apiculate, bordered by a yellowish brown margin, ciliate-dentate above; costa thick, nearly continuous; cells of the areolation round-hexagonal, chlorophyllose, those of the base oblong and nearly empty: capsules clustered (2 or 3), oval-oblong, nearly pendent; lid mammiform; segments of the inner peristome orange-colored, broadly lacunose, with 2 or 3 intermediate cilia. — Lond. Journ. Bot. ii. 669 (1843); Sulliv. Mosses of U. States, 47, and Icon. Musc. 83, t. 51; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 199.

Hab. White Mountains (*Oakes, James*); Maine (*Scribner*); Ontario (*Macoun*); British America (*Drummond*); Oregon (*Hall*), n. 257, partly.

6. **M. rostratum**, Schwaegr. Loosely cespitose, with long creeping stolons; fertile stems short, simple, erect: branch- and

stem-leaves narrowed at base, broadly obovate or lingulate, the comal longer, spatulate, recurved when dry, undulate on the reflexed borders, with broad distantly serrate brown margins, mucronate or apiculate by the stout excurrent costa; perichætial leaves lanceolate, entire, strongly costate: calyptra persistent: capsules ovate, yellowish, soft, more or less inclined on the curved pedicel, 1 to 3 in the same perichætium; lid convex, conical-beaked, pale yellow; outer peristome yellow, the inner orange. — Suppl. i. 2. 136, t. 79; Bryol. Eur. t. 395. *Bryum rostratum*, Schrad. Spicil. Fl. Germ. 72.

HAB. Along woodland rivulets, wet sand or rocks wet by spray; not rare on the Eastern slope; not yet found on the Western.

++ *Flowers dicecious; the male discoid.*

7. **M. affine**, Bland. Plants large, widely and loosely cespitose, sometimes stoloniferous: leaves spreading, recurved when dry and crispate on the borders; lower stem-leaves round-obovate, those in the middle ovate-oblong, more or less decurrent, the upper crowded and rosulate, obovate and long-spatulate; outer perichætial leaves narrowly spatulate, the inner lanceolate, all more or less abruptly acuminate and cuspidate by the stout excurrent costa, bordered all around with an acutely dentate margin: male flowers large: capsules clustered (1 to 3 or more), pendent, oblong, glaucous-green until fully ripe, then yellowish brown; lid convex, apiculate; peristome as in the preceding. — Schwaegr. Suppl. i. 2. 134; Bryol. Eur. t. 397. *M. cuspidatum*, Neck.; Lindb. Mniac. Eur. 63.

Var. **elatum**, Bruch & Schimp. Stems slender; stolons erect: leaves bordered with a pale margin, with short and distant teeth: capsule shorter, generally solitary.

Var. **rugicum**, Bruch & Schimp. Plants shorter, simple, with shorter leaves; those of the branches cordate, apiculate or not, nearly entire: capsule smaller, inclined or cernuous.

HAB. On the ground and shaded banks or roots of trees, common; var. *elatum* on damp sandstone rocks in woods, Southern Ohio.

8. **M. insigne**, Mitt. Plants robust, yellowish green; stems simple, erect, remotely foliate, radiculose at the base only: leaves oblong and oblong-lanceolate, cuspidate by the excurrent costa, long-decurrent at the gradually narrowed base, surrounded by a colored serrate margin; outer perichætial leaves longer, the inner short, narrow, subulate: capsule long-pedicellate, half

pendent, ovate-cylindrical, clustered (2 to 4); lid convex, obtusely apiculate. — Sulliv. Icon. Musc. Suppl. 53, t. 37.

HAB. Western side of the Rocky Mountains, and Vancouver Island; not rare.

Mitten says that it differs from *M. affine* in its longer narrower leaves, which are widely decurrent at base, while they are not at all decurrent in *M. affine*. Sullivant rightly remarks that the distinction in the form of the leaves is quite correct, but that in *M. affine* the leaves are always more or less decurrent, and that it is therefore difficult to separate these species.

* * *Leaves with a thick doubly dentate margin.*

+ *Lid mamillate.*

9. **M. hornum,** Linn. Dicœcious: plants densely cespitose, densely radiculose below; stems simple, bearing at base a few densely foliate flagelliform branchlets: leaves gradually closer and larger from the base upward, open, erect, slightly or not at all decurrent, a little twisted when dry, the lowest squamiform with borders entire and costa reddish, the middle oval-oblong, the upper oblong; outer perichætial leaves narrowly lingulate-spatulate, the inner lanceolate, all sharply acuminate and firmly dentate: capsule long-pedicelled, horizontally inclined, elliptical, green when ripe and filled with the spores. — Spec. Pl. 1112; Bryol. Eur. t. 390.

HAB. More generally on quartz or schistose rocks; plains and mountains. White Mountains (*Oakes*); mountains of North Carolina (*Buckley*); Lancaster and Northampton Counties, Pennsylvania (*T. P. James*); Nova Scotia (*N. B. James*).

+ + *Lid rostrate.*

10. **M. serratum,** Laich. Bisexual: loosely cespitose; tufts soft, bright green; stems short, slender, purplish, simple or with slender basilar erect branchlets: leaves distant, decurrent, more or less twisted when dry, the lower ovate-lanceolate, the upper oblong spatulate-lanceolate; perichætial leaves narrowly lingulate-lanceolate, all acutely acuminate, with spinulose-dentate margins, which are confluent at the apex with the costa: capsule horizontally inclined, oval and oblong, pale yellow, purple at the orifice, soft; lid pale. — Pl. Eur. 478; Brid. Musc. Recent. i. 3. 84, t. 1; Bryol. Eur. t. 391. *Bryum serratum*, Schrad. Spicil. Fl. Germ. 71, in part (?). *M. marginatum*, Beauv.; Lindb. Obs. Mniac. 46.

HAB. Sandy borders of rivulets in woods; not rare. Not yet found on the Western slope, as Drummond's n. 259, so named, is referred by Schimper to the following species. But a close examination of the speci-

mens of three of Drummond's sets has failed to show a single diœcious plant; hence Schimper's reference is still uncertain.

11. **M. orthorrhynchum,** Bruch & Schimp. Diœcious. Differs from the preceding in the inflorescence, the plants somewhat more solid and more densely foliate, with a slightly smaller areolation, the teeth more acute, the costa spinulose on the back, the male flowers discoid and polyphyllous, the capsule subventricose, slightly curved upwards, as also the beak of the lid, which is somewhat longer and thicker, and the spores twice as large. — Bryol. Eur., t. 391.

HAB. Niagara Falls (*Clinton*); Easton, Penn. (*James*); Ontario (*Macoun*); Colorado (*Rothrock & Wolf*); British America (*Drummond*).

12. **M. lycopodioides,** Schwaegr. Diœcious: plants loosely cespitose, slender, dirty green: lower leaves distant, oblong, the upper gradually larger and long-lingulate, the perichætial sublinear, all cuspidate by the excurrent reddish brown costa; teeth of the brown margin close and sharply acute; areolation dense: capsule horizontal, longer than in the last two species, subcylindrical and more or less incurved, brown; teeth longer. — Suppl. ii. 2. 24, t. 160; Bryol. Eur. t. 392.

HAB. Borders of rocky brooks in pine woods; Adirondack Mountains (*Lesquereux*); White Mountains (*James*); Canada (*Mrs. Roy*).

13. **M. umbratile,** Mitt. Diœcious: plants loosely cespitose or gregarious, dark green: leaves loosely spreading, the lower smaller, oblong, acute or very entire, the upper elliptical-oblong, short-apiculate, long-decurrent, with narrow doubly serrate borders; costa percurrent; cells of the areolation rounded, thick-walled; inner perichætial leaves short, lanceolate, the outer long-linear, narrower than those of the stem: capsule solitary, cylindrical-oblong, narrowed at base, curved, subinclined or horizontal on a long reddish flexuous pedicel; lid pale, conical, beaked. — Journ. Linn. Soc. viii. 30; Sulliv. Icon. Musc. Suppl. 51, t. 35.

HAB. Mountain Rocks, Portage River (*Drummond*); Galton Mountains, British Columbia (*Lyall*).

Resembles in its foliage *M. serratum*, Brid., but is allied by its inflorescence to *M. orthorrhynchum*, differing from it in its softer leaves, with cells four times as large, and also from the last species, whose cells are only half as large and the comal leaves long and narrow.

14. **M. spinosum,** Schwaegr. Diœcious: plants widely and loosely cespitose, stout, dark purple, often 2–3-parted;

branchlets densely foliate, flagelliform: lower leaves small and distant, squamiform, oblong, obtuse, entire, scariose, the upper and comal abruptly larger, spreading open, crispate when dry, ovate or oblong-acuminate, spatulate; perichætial leaves narrower, shortly cuspidate by the excurrent brown costa, margin purplish brown; teeth spiniform: male plants mixed with the fertile or in separate tufts: capsules clustered (1 to 5), ovate-oblong, solid, horizontal or inclined on a reddish pedicel; lid conical, obtusely beaked. — Suppl. i. 2. 130, t. 78; Bryol. Eur. t. 393. *Bryum spinosum*, Voit in Sturm, Deutschl. Fl. ii. t.

HAB. Under low pendent branches of pines, in middle districts of the Rocky Mountains (*Downie*); very rare.

A beautiful species, easily distinguishable by its dark green foliage, the leaves abruptly longer at the top of the stem, and the male flowers rosulate.

15. **M. spinulosum,** Bruch & Schimp. Synœcious: resembling the last; plants less robust, bright or yellowish green: leaves broader, longer-decurrent at base, more abruptly enlarged, obovate-oblong, less crispate when dry, apiculate by the excurrent costa; margin reddish; outer perichætial leaves narrowly acuminate-lyrate, the inner very small, lanceolate: capsules generally clustered (2 to 6), smaller and shorter, mostly pendent or more inclined, thin, greenish yellow when ripe, yellowish brown when empty; lid narrower, conical, short-beaked, orange-colored. — Bryol. Eur. t. 394.

HAB. Pine woods in the mountains; not rare.

This species is very rare in Europe, while the preceding is quite common in the Jurassic or subalpine region. It is the reverse for the distribution of these two species in North America.

* * * *Leaves without margins, serrate or entire.*

\+ *Lid highly convex, obtuse or apiculate.*

16. **M. stellare,** Reichard. Dicœcious: sub-cespitose, pale green: leaves soft, gradually larger up to the apex of the stems, open, erect, slightly decurrent, oblong and long elliptical-acuminate, the lower nearly entire, the upper simply and irregularly dentate; perichætial leaves longer and narrower; costa slender, vanishing abruptly below the apex: capsule solitary, horizontally inclined, ovate-oblong, nearly regular, soft; lid orange, convex, obtuse. — Hedw. Spec. Musc. 191, t. 45; Bryol. Eur. t. 401. *M. Blyttii*, Bruch & Schimp. Bryol. Eur. t. 400; Lindb. Mniac. Eur. 54.

Hab. Shaded banks, on humus; roots of trees. Very rare in fruit.

Schimper says (Syn. ed. 2, 487), that fruiting specimens of *M. Blyttii*, found by Dr. Kiær in Dovrefield, Norway, oblige him to unite that species to *M. stellare*, from which it differs merely in its more compact tufts and higher stems.

17. **M. cinclidioides,** Hueben. Dicœcious: plants large, loosely cespitose, bright green and shining when young, blackish when old, the sterile branches with larger leaves; stems dark brown: leaves remote, large, the lower inserted only by the dilated base of the costa, round-ovate or exactly oblong, the upper and comal broadly lingulate, rounded and slightly emarginate at the apex or shortly apiculate, deeply undulate; outer perichætial leaves spatulate, the inner small and lanceolate; costa gradually narrower upward, vanishing below the apex; all the leaves thin, subscarious, soft, scarcely changed when dry; areolation obliquely oval, loose: capsule on a long slender pedicel, abruptly pendent, ovate; lid convex, apiculate or acuminate. — Musc. Germ. 416; Bryol. Eur. t. 402.

Hab. Bogs, in New England (*Eaton, Ingraham, James*).

* * * * *Leaves margined, very entire.*

\+ *Lid rostrate.*

18. **M. punctatum,** Hedw. Dicœcious: plants in loose dark or yellowish green tufts; stems rigid, covered up to the fruit-bearing apex with dark brown rootlets: branch- and stem-leaves remote, open or reflexed, large, the lower round-ovate, narrowed to the base, inserted by the enlarged costa; the upper rosulate, 4 to 6, broadly ovate-spatulate, surrounded by a brown hard thick margin, subemarginate and apiculate at the summit; costa purplish, abruptly vanishing near the apex: male plants more slender, with scarcely any stem-leaves: capsule oval, mostly solitary, horizontally inclined, green when ripe; lid acutely beaked. — Spec. Musc. 193; Bryol. Eur. t. 387.

Hab. Cold springs and borders of brooks, on mountains; rarely fruiting.

Besides var. *elatum*, Bruch & Schimp., whose robust stems are 12 to 15 c.m. long, local varieties are often noted. Specimens from Alaska have the leaves bordered by a thick broad dark orange margin.

19. **M. subglobosum,** Bruch & Schimp. Syncœcious: appearing at first sight like a more compact form of *M. punctatum*, with slender densely tomentose yellowish brown stems and small leaves, but differing essentially in its bisexual flowers

and in its broadly obovate leaves, not emarginate nor apiculate at the apex, the margins broader, not thicker, and uniform in color; the capsules (not yet ripe) are small, shorter, abruptly pendent; lid conical-beaked, straight, not very acute. — Bryol. Eur. t. 388. *M. pseudopunctatum*, Bruch & Schimp., in Lond. Journ. Bot. ii. 669 (1843).

HAB. Swamps and wet places in woods; Northwestern America (*Drummond*, fide Schimper).

20. **M. hymenophylloides**, Hueben. In soft loose pale green tufts; stems radiculose below, dark brown: lower leaves round-ovate, the upper narrowed at base, shortly and obtusely acuminate; costa gradually thicker toward the base, vanishing below the apex; branch-leaves distant, vertically exposed and distichous, the young pale or yellowish green, the old brownish, more solid, equally margined all around: fruit unknown. — Musc. Germ. 416; Bryol. Eur. t. 399.

HAB. Trenton Falls, New York (*James*).

* * * * * *Stems tree-like: leaves dimorphous.*

21. **M. Menziesii**, Muell. Dicœcious: loosely cespitose; stems rigid, 6 to 10 c.m. long, tomentose at base, dividing at the summit into numerous spreading simple branchlets covered with distant appressed squamiform scarious lanceolate acuminate whitish leaves, ciliate-dentate from the middle upward; costa vanishing below the apex; branch-leaves ovate, lanceolate-acuminate, simply serrate above, concave-plicate, the costa abruptly spinose on the back, vanishing below the apex; perichætial leaves broadly oval, long-acuminate, serrulate at the apex: pedicels long, generally clustered: capsule oval-cylindric, broad-mouthed, pendent; peristome large, robust. — Syn. i. 177. *Bryum Menziesii*, Hook. Bot. Misc. i. 36, t. 19. *Hypnum acanthoneuron*, Schwaegr. Suppl. iii. t. 258^{b}. *Rhizogonium acanthoneuron*, Muell. Bot. Zeit. v. 803. *Leucolepis acanthoneura*, Lindb. Mniac. Eur. 87.

HAB. Western coast of North America; not rare.

88. CINCLIDIUM, Swartz.

Closely allied to *Mnium*, separated especially by the peculiar structure of the peristome; the outer composed of linear-lanceolate obtuse teeth, transversely latticed and membrana-

ceous on the inside, shorter than the inner peristome, to which they are adherent before becoming free by age, yellowish brown, hygroscopical; the inner formed of a cupuliform reticulate membrane, pierced at the top by the point of the columella, 16-plicate and -carinate, the keels alternating with the outer teeth, solid, orange-colored, persistent as carinate columnar remnants between the teeth after the falling of the lid. Annulus small, rudimentary, persistent. Spores very large, brown or green.

1. **C. stygium,** Swartz. Stem blackish tomentose, simple or bearing few branchlets, rather distantly foliate: lower leaves scattered, round-ovate, obtuse, the upper crowded into a rosulate tuft, abruptly broadly ovate or ovate-oblong from the narrowed base, apiculate; borders opaque, cartilaginous; costa dirty green or blackish in old leaves, subpercurrent: capsule pendent, oblong-pyriform with an inflated apophysis. — Schrad. Journ. v. 27, t. 2 (1801). *Mnium stygium*, Bruch and Schimp. Bryol. Eur. t. 385.

HAB. Rocky Mountains (*Drummond*).

2. **C. subrotundum,** Lindb. Differing from *C. stygium* especially in its smaller size and bisexual flowers; the leaves rounded from a very short narrowed base, emarginate and obtusely short-apiculate, with the nearly flat borders narrowly margined by a double row of dark red cells, the costa vanishing below the apex, the cells large, disposed in diverging rows, irregularly rhomboidal-oval, very slightly but uniformly thickened, chlorophyllose; the capsule small, very thin, inclined or subpendent, globose-oval, purple and narrowed at the orifice, with a very short collum, the lid very highly convex and very shortly apiculate, the teeth yellow, linear-lanceolate, muticous; the spores green and slightly smaller. — Mniac. Eur. in Faun. Flor. Fenn. ix. 72.

HAB. Greenland (*Vahl*) and Labrador (*Breutel*), according to Lindberg.

89. RHIZOGONIUM, Brid.

Stems simple, or rarely branching by innovations. Leaves solid, rigid. Capsule obconical, cernuous, long-pedicellate. Peristome double, perfect.

1. **R. spiniforme,** Bruch. Syncœcious: stems long, tomentose below, erect, simple or divided in the middle; branches of equal length, curved, loosely foliate: stem-leaves fuscous, long-lanceolate, doubly-serrate on the borders, coarsely serrate at the apex; costa sharply serrate above, excurrent; perichætial leaves broadly oval at the clasping base, abruptly acuminate; cells of the areolation round, small, somewhat obscure: capsule inclined or horizontal, obconical, enlarged at the orifice, truncate; pedicel very long; lid with a short curved beak. — Regensb. Flora, xxix. 134 (1846). *Mnium spiniforme*, Muell. Syn. i. 175.

HAB. Gulf shores, Alabama and Louisiana; in deep swamps at Spring Hill, near Mobile (*Mohr*); not rare in Florida.

90. LEPTOTHECA, Schwaegr.

Leaves large, marginate. Calyptra dimidiate. Capsule cylindric-oblong. Peristome double, the outer of 16 linear-lanceolate erect teeth, the inner a thin membrane, short and entire, or longer and cut into 16 segments, with or without intermediate rudimentary cilia.

1. **L. Wrightii,** Sulliv. Pseudo-monœcious: stems short, simple, in dense tomentose tufts: leaves rosulate, spreading, the comal oblong-obovate or obovate-spatulate, narrowly margined, apiculate or cuspidate by the excurrent often recurved costa; borders recurved and serrulate above; cells oval-hexagonal, filled by the contracted utricle: calyptra dimidiate-subulate: capsule erect, cylindrical, slender; lid conical, short-beaked; teeth very long and narrow, minutely papillose, contracted at the articulations; inner membrane short, not passing above the large compound annulus. Minute male buds, evidently from the germination of spores, occur on various parts of the fertile plants. — Proc. Amer. Acad. v. 281.

HAB. Enterprise, Florida (*W. L. Foster*, 1875).

SUBTRIBE I. AULACOMNIEÆ.

Plants radiculose. Leaves densely areolate, the cells small, round or hexagonal-rectangular. Capsule ovate-oblong, short-necked. Peristome of *Mnium.*

91. AULACOMNIUM, Schwaegr. (Pl. 3.)

Leaves oblong or long-lanceolate, papillose; costa semiterete, dissolved below the apex; areolation nearly equal. Flowers diœcious, the male discoid or gemmiform. Calyptra narrowly cucullate, long-beaked. — *Sphærocephalus*, Neck.

* *Diœcious; male flowers gemmiform, terminal.*

1. **A. androgynum**, Schwaegr. Tufts dense, green above, ferruginous-tomentose inside; stems often prolonged into small granuliferous apical heads (*pseudopodia*): leaves linear-lanceolate, obscurely denticulate at the apex, curved, slightly twisted when dry; cells of the areolation small, round, papillose on both faces: calyptra descending to the middle of the capsule, long-beaked: capsule cylindrical-oblong, cernuous-horizontal, furrowed when old; lid large, highly convex-conical; annulus compound, revoluble. — Suppl. iii., t. 215; Bryol. Eur. t. 406. *Mnium androgynum*, Linn. Spec. Pl. 1110. *Orthopyxis androgyna*, Beauv.; Lindb. Mniac. Eur. 77.

Hab. On bare earth, roots of trees, in fissures of granite rocks, etc.; plains and mountains. Chimney Rocks, French River (*Sullivant*). Very rare on the Eastern slope, very common on the Western.

* * *Diœcious; male flowers discoid.*

2. **A. palustre**, Schwaegr. In wide deep tufts, tomentose-radiculose, reddish brown inside, yellowish or dirty green above; stems long, flexuous: leaves erect-spreading, flexuous, twisted when dry, the lower broader than the upper, linear-lanceolate, carinate, transversely undulate, crenulate at the apex, reflexed on the borders, acutely papillose on both faces: male plants similar to the fertile ones and mixed with them; antheridia and clavate paraphyses numerous: capsule long-pedicellate, turgid, ovate-oblong, curved in the middle; lid large, highly convex at base, conical, blunt at the apex; peristome large; teeth narrowed into long subulate points; segments long, subulate; cilia of equal length, free or partly coherent; annulus large, compound, revoluble. — Suppl. iii., t. 216; Bryol. Eur. t. 405. *Mnium palustre*, Linn. l. c. *Gymnocybe palustris*, Fries; Lindb. l. c. 87.

Var. **imbricatum**, Bruch & Schimp. Leaves broader, imbricate, very entire, not twisted when dry.

Var. **fasciculare,** Bruch & Schimp. Much divided into short nodose branches and flagelliform branchlets.

Var. **polycephalum,** Bruch & Schimp. Plants with numerous long pseudopodia.

Var. **alpestre,** Schimp. Stems short, slender; branches fasciculate, copiously fruiting, without pseudopodia.

HAB. Very common in boggy ground; plains and mountains; the varieties in alpine regions.

3. **A. turgidum,** Schwaegr. Widely and densely cespitose; tufts yellowish green above, light brown below; stems without radicles, easily loosened: leaves closely imbricate, 8-ranked, ovate-oblong, obtuse, concave, very entire, reflexed on the borders, distantly papillose on both faces; costa thin, vanishing below the apex: capsule slightly narrower than that of the preceding species; lid highly convex, short-mamillate; segments split and disjointed; annulus shorter. — Suppl. iii. 1. *Aulacomnium*, 7; Bryol. Eur. t. 404. *Mnium turgidum*, Wahl. Fl. Lapp. 351, t. 23. *Gymnocybe turgida*, Lindb. l. c. 85.

HAB. Bogs; White Mountains (*Oakes, James*); Lake Superior (*Agassiz*); Adirondack Mountains (*Lesquereux*); rare.

4. **A. papillosum.** Stems long and slender, flexuous, covered with radicles, divided at the apex into fastigiate short branches: lower leaves distant, the upper gradually closer, slightly crispate, yellowish green or shining white, strict when dry, ventricose, decurrent and inflated by loose brown cells at the lanceolate oblong base; branch-leaves smaller, short-acuminate; stem-leaves long-acuminate, more or less undulate toward the apex; borders revolute in the lower part, erect above, crenate-dentate or denticulate-serrulate; cells of the areolation single-papillate, close, very scabrous; costa thick, green, deeply canaliculate, vanishing below the apex; pseudopodia short, yellow: fruit not known. — *Mnium papillosum*, Muell. Regensb. Flora. lviii. 93 (1875).

HAB. Colorado.

Species intermediate between *A. palustre* and *A. androgynum*, differing from the first in the more minutely areolate and papillose leaves; from the second in the leaves very roughly papillose and never coarsely serrate; and from both in the inflated base of the leaves.

* * * *Monœcious: male flowers gemmiform, axillary.*

5. **A. heterostichum,** Bruch & Schimp. Plants in wide pale green tufts, tomentose below; stems increasing by annual

innovations: leaves inclined to one side, the lower obovate, gradually longer upward and obovate-oblong, incurved on one side, open at the other below, nearly flat toward the apex, serrate-denticulate from the middle upward, obtusely apiculate, densely areolate; costa yellowish brown, vanishing below the apex: buds of the male flowers sessile along the stems, radiculose at base; inner perigonial leaves broadly ovate-concave, abruptly acuminate, costate: capsule on a short erect pedicel, oblong, slightly incurved and inclined; lid convex, obtusely short-beaked; peristome large; segments open but not disjoined; cilia 2 or 3, a little shorter than the segments; annulus large, revoluble. — Bryol. Eur. t. 403; Sulliv. Mosses of U. States, 43, t. 3. *Orthopyxis heterosticha*, Beauv.; Lindb. l. c. 78.

HAB. Shady banks and slopes in the woods; common on the Eastern slope of the United States.

SUBTRIBE II. TIMMIEÆ.

Stems simple or dichotomous by annual innovations. Leaves nearly equal; areolation round-hexagonal, papillose in the upper part, loose at the base. Flowers monœcious and diœcious. Inner membrane of the peristome obscurely 16-carinate at base, divided above into numerous filiform segments, which are united by fours at the apex.

92. TIMMIA, Hedw. (Pl. 3, v)

Leaves narrowly lanceolate, recurved or spreading from a long-clasping base, coarsely serrate above; costa round, stout. Calyptra narrow, cucullate. Capsule on a long thick pedicel, horizontal or inclined, obovate-oblong, obscurely striate or smooth, short-necked. Lid convex, papillate or depressed in the middle. Annulus narrow. Spores very small.

1. **T. megapolitana**, Hedw. Monœcious: plants loosely cespitose, bright green above: leaves deeply serrate from above the clasping base, concave, cirrhate and fistulose when dry; inner perichætial leaves thin, ovate-lanceolate: male flowers 1 to 3 at the base of the female, short-pedicellate: calyptra long, very narrow, often left attached to the pedicel or more rarely

persisting upon the capsule until ripe: capsule oval-oblong, horizontal, inclined or pendent, furrowed and erect when dry; lid orange; segments appendiculate. — Musc. Frond. i. 84, t. 31; Bryol. Eur. t. 407. *T. cucullata*, Michx. Fl. Bor.-Am. ii. 304.

Hab. Wet shaded banks, in woods; plains and mountains; not rare.

T. cucullata, Michx., differs from the normal form in the pedicels of the antheridia a little shorter. It is an American variety.

2. **T. Austriaca,** Hedw. Dicœcious: plants stronger and longer: leaves with a longer clasping dirty yellow base, more solid, yellowish green, shining, serrate downward to the sheathing border; perigonial leaves clustered into a long sheath, spreading at the apex: antheridia longer, shorter-pedicellate: capsule on a long-pedicel, horizontal, oval-oblong, with a longer collum, more solid, brown-striate, more distinctly costate when dry; lid highly convex, mamillate, orange-colored; teeth longer; segments punctulate, not appendiculate. — Spec. Musc. 176, t. 42; Bryol. Eur. t. 408.

Hab. Rocky Mountains of Colorado (*E. Hall, Downie*).

Tribe XIV. POLYTRICHEÆ.

Plants very variable in size and appearance, of woody or strong texture, often covering wide surfaces, dividing by basilar innovations, or rarely from the apex, or in male plants from the centre of the flowers. Leaves very solid, with an enlarged costa, generally lamellate on the inside and with a thick serrate margin. Flowers dicœcious, rarely monœcious or bisexual; vaginule long. Calyptra cucullate, naked, spinulose or villous, often covered with long pendent hairs reaching to below the capsule. Capsule long-pedicellate, erect or cernuous, cylindrical or angular. Peristome simple, rarely none; teeth 32 or 64, rarely 16, linguiform, solid, confluent at base, formed of a multiple stratum of thick-walled cells, their points adherent to the disk-like apex of the columella. Spores very small.

93. ATRICHUM, Beauv. (Pl. 3.)

Densely gregarious or cespitose. Leaves not sheathing at base, lingulate, undulate-crispate or twisted when dry, very

chlorophyllose, narrowly margined, acutely serrate; costa nearly round, lamellate; areolation very close, round-hexagonal. Flowers diœcious, rarely monœcious, the male cup-shaped; antheridia and paraphyses filiform. Calyptra hairy at the apex only. Capsule oval or cylindrical, cernuous or arcuate. Lid long subulate-rostrate. Peristome of 32 teeth, contiguous to the thick columella. — *Catharinea*, Ehrh.

1. **A. undulatum**, Beauv. Stems erect, simple or dichotomous: lower leaves very small, squamiform, the upper and comal long, narrowly lingulate, undulate on the borders, hispid on the under surface by transverse rows of small teeth, smooth on the upper, yellowish margined; costa narrow, round, with 2 to 5 lamellæ, spinulose on the under side toward the apex: fruits clustered (1 to 3): calyptra hispid at the apex, persistent: capsule long-cylindrical, arcuate or erect, dark brown; teeth narrowly lingulate, minutely verruculose, marked with orange lines in the middle. — Prodr. 42; Bryol. Eur. t. 410. *Bryum undulatum*, Linn. Spec. Pl. 1117. *Polytrichum undulatum*, Hedw. Musc. Frond. i. 43, t. 16, 17. *Catharinea Callibryon*, Ehrh. Beitr. i. 189.

Hab. In woods, on sandy ground; tops of old standing trunks, along roads, etc. Less common than the following and very variable.

The species is diœcious, but sometimes the young male plant produces from the centre of the flower an innovation bearing female flowers, and thus the male plant is transformed into a fertile one.

2. **A. angustatum**, Bruch & Schimp. More slender than the last, with the narrower leaves more densely areolate, and serrate at the apex only, the costa 5–6-lamellate: flowers diœcious: capsule nearly erect or subarcuate, narrowly cylindrical, dark purple, shining; lid shorter-rostrate; teeth shorter. — Bryol. Eur. t. 411. *Polytrichum angustatum*, Brid.; Hook. Musc. Exot. t. 50. *Catharinea angustata*, Brid. Musc. Recent. Suppl. iv. 204.

Hab. Woods and sandy hills, in dryer places than the last; very common.

3. **A. Selwyni**, Aust. Differs from the preceding in the broader subspatulate leaves generally obtuse, excavated at the base, the lamellæ of the costa (4 to 6) broad, and the calyptra very smooth. — Coult. Bot. Gaz. ii. 95.

Hab. Northwest coast of British America (*Macoun*).

4. **A. xanthopelma.** Dicœcious: widely and loosely cespitose, blackish, slender: stem-leaves crispate, twisted when dry, spreading when moist, short and narrow, lanceolate, obtuse, undulate on the borders, very narrowly margined upward to near the apex, simply dentate with short rarely aculeate teeth; costa 4–6-lamellate, sparingly dentate at the apex, more densely on the back; cells of the areolation small, quadrate, round-hexagonal toward the apex: calyptra very narrow, hispid at the apex: capsule cylindrical, narrow, slightly curved on a long yellow pedicel; lid obliquely rostrate from a highly convex base; teeth of the peristome long and narrow. — *Catharinea xanthopelma*, Muell. Regensb. Flora, lvi. 482 (1873).

HAB. Texas (*J. Boll*).

Very closely allied, like the last, to *A. angustatum*, of which it appears to be a variety, differing only in the short simple teeth of the very narrow margin, those on the back of the costa similar to those of the margin and very few, and the pedicel yellow.

5. **A. Lescurii,** James. Plants loosely cespitose or gregarious, nearly black: stems simple, 2 or 3 c.m. long, slender, naked below, loosely foliate above: leaves incurved-crispate when dry, erect-spreading when moistened, linear-lanceolate, acuminate, concave, sharply serrate on the borders, enlarged, half-clasping and ciliate at base; basilar cells subquadrate, the upper nearly round, obscure; costa percurrent; lamellæ 4 to 8, convex on the back, serrate: capsule erect, cylindrical-ovate, short, enlarged at the orifice and turbinate when empty; pedicel short and thick. — Bull. Torr. Club, vi. 33.

HAB. Alaska (*Kellogg*). A fine species, quite distinct in the narrow crisped leaves, with 6 or 8 long flexuous cilia on each border near the sheathing base, and in the serrate lamellæ; lid and peristome not seen.

6. **A. crispum,** James. Dicœcious: plants densely gregarious, arising from a subterranean rhizome, dark green; stems 3 or 4 c.m. long, erect, flexuous, simple, slender, radiculose at the base only: leaves large, erect, open and spreading, not sheathing, the upper closer, longer, lingulate-lanceolate, undulate-crispate when dry, narrowly brown-margined, sharply serrate on the borders, smooth on the back; costa percurrent, nearly round, with very few narrow lamellæ; basilar areolation loose, oblong, the upper of small hexagonal chlorophyllose cells: male flowers cup-shaped; outer perigonial leaves three, large, spatulate-lanceolate, the inner numerous, very small, abruptly

enlarged in the middle from a narrow base and contracted to the blunt point, entire: calyptra twisted, hirsute at the apex: capsule erect or inclined and slightly curved, obovate, cylindrical, narrowing at base to a short pedicel; lid obliquely rostrate; teeth white and hyaline, excepting the medial dark orange line. — Sulliv. Mosses of U. States, 41, and Icon. Musc. 73, t. 46. *Catharinea crispa*, James, Journ. Acad. Philad. 1855, 445.

HAB. Grassy banks of small streams, and boggy ground, near Camden, New Jersey.

7. **A. parallelum,** Mitt. Dicœcious: plants loosely cespitose, dark green; stems simple, short, solid, erect: leaves half-open, incurved when moist, the upper longer, lingulate-lanceolate, sharply dentate (not margined) from below the middle, marked on the back by small thin tooth-like processes parallel to the costa, which is also 2–3-lamellate on the back, and the lamellæ dentate; lower leaves shorter, oblong, more obtuse; perichætial leaves oblong, convolute at base, gradually narrowed and lanceolate: male plants more slender, the flowers cup-shaped: capsule long and subcylindrical, slightly arcuate, contracted under the orifice, ventricose below; surface verrucose. — Journ. Linn. Soc. viii. 48, t. 8; Sulliv. Icon. Musc. Suppl. 54, t. 38.

HAB. Grand Côté, Rocky Mountains (*Drummond*); mixed with the following.

With the size and habit of *A. undulatum*, distinguished by the capsule more ventricose below, and by the characters indicated above.

94. OLIGOTRICHUM, DC.

Stems simple, from subterranean stolons. Leaves long, linear-lanceolate, incurved on the borders, not margined, subtubulose at the apex, distantly serrulate, incurved-hooked when dry; costa subterete and naked at base, gradually dilated upward and covered with numerous undulate sinuous and crenulate lamellæ. Flowers dicœcious, the male cup-shaped, proliferous; paraphyses partly filiform, partly spatulate. Calyptra large, scarcely covered with erect hairs. Capsule erect, ovate-oblong, cylindrical, thin. Lid convex-conical, acuminate or long rostrate. Teeth of the peristome thin, irregular.

1. **O. aligerum,** Mitt. Dicœcious: plants loosely cespitose or gregarious, black, radiculose toward the base; stems short

and slender: leaves open or spreading, oblong-lanceolate, smooth, blunt-pointed, entire at base, short-dentate above, alate on the back by longitudinal dentate lamellæ; costa percurrent, carinate, 5–7-lamellate; areolation round-quadrate, distinct; perichætial leaves ovate, sheathing at base, erect, narrower and subulate to the apex, with round pellucid areolation: male plants shorter, proliferous from the centre of the flowers: calyptra with a few erect hairs on the upper part: capsule of the same form as in the last species. — Journ. Linn. Soc. viii. 48, t. 8; Sulliv. Icon. Musc. Suppl. 55, t. 39.

Hab. Grand Côté, Rocky Mountains (*Drummond*).

2. **O. Lyallii,** Lindb. Plants robust, cespitose, dirty yellow; stems fastigiately branching from the middle, plicate, naked at base, densely foliate above: leaves broader, oblong, clasping at base, open, narrowly lanceolate-acuminate above, densely lamellate, convex and smooth on the back; borders incurved, distantly serrate from the middle upward; inner perichætial leaves with a long convolute base and a short acumen: male flowers unknown: calyptra fugacious, with few appressed hairs, split on one side: capsule on a long flexuous reddish pedicel, slightly inclined, cylindrical-oblong, ventricose below, biplicate above, plicate-rugose at base when empty; lid broadly conical at base, subulate-rostrate. — Obs. Polytrich. in Faun. Flor. Fenn. ix. 102. *Polytrichadelphus Lyallii*, Mitt. Journ. Linn. Soc. viii. 49, t. 8; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. (ed. 2), n. 322.

Hab. British Columbia (*Lyall*); Rocky Mountains, Colorado, in pine woods (*E. Hall*); high mountains of California (*Bolander*).

95. PSILOPILUM, Brid.

In aspect and mode of growth like *Oligotrichum*. Leaves oblong, sheathing at base, open, erect above, obovate-oblong, very concave, muticous at the slightly incurved apex; borders irregularly crenulate above; lamellæ of the costa subundulate, gradually narrowed, thin and disappearing toward the base; upper areolation minute, subquadrate, long-rectangular at the sheathing base. Calyptra very narrow, smooth. Capsule ovate-gibbous, incurved, laterally compressed, stomatose at base, rugulose when dry, the orifice narrow. Lid short, convex-

conical, with a short incurved beak. Teeth long, some of them bipartite, thin. Diaphragm of the columella funnel-shaped.

1. **P. arcticum**, Brid. Stems short, simple: capsule ferruginous, black when old. — Bryol. Univ. ii. 96. *Oligotrichum lævigatum*, Bruch & Schimp. Bryol. Eur. t. 414. *O. glabratum*, Lindb. Obs. Polytrich. in Faun. Flor. Fenn. ix. 143.

HAB. Peat bogs; Labrador, Greenland and Arctic America.

96. POGONATUM, Beauv. (Pl. 3.)

Plants short and simple, or robust and long, with dendroid ramification; fertile plants arising from subterranean stolons or from a radical prothallium, dividing by innovations from the middle of the stems or from under the perichætium. Flowers dicœcious; male flowers proliferous. Leaves clasping at base, open, unaltered by moisture; costa covered with very numerous lamellæ occupying nearly the whole lamina, rendering the leaves hard and coriaceous; margins spinulose-serrate. Capsule regular, erect, or cernuous. Peristome of 32 teeth, orange in the middle.

§ 1. ALOIDEA. *Plants short, simple, gregarious or scattered, radiculose at base.*

1. **P. brevicaule**, Beauv. Plants short, scattered, growing out of a persistent dark green confervoidal prothallium; stem simple, very short, ½ to 1 c.m. long, densely foliate: lower leaves small, appressed, ovate, short-pointed, the upper larger, erect-open, clasping at the enlarged base, lanceolate-acuminate; perichætial leaves very long, oblong, membranaceous, obscurely costate at base, more abruptly narrowed into a long erect obtusely serrate acumen; lamellæ capitate-claviform in transverse section: male plants in short rooting buds; perigonial leaves erect, curved back from above the middle, imbricate, broadly obcordate, with a thick medial nerve excurrent into an inflated mucronate point: calyptra very hairy, covering the capsule to the base: capsule cylindrical-oblong, papillose, gradually narrowed to a short pedicel; lid convex, enlarged at base, abruptly short-beaked. — Prod. 84; Sulliv. Mosses of U. States, 41, and Icon. Musc. 75, t. 47. *Polytrichum Pennsylvanicum*,

Hedw. Spec. Musc. 96, t. 21. *Polytrichum tenue*, Menz.; Lindb. Polytrich. 140.

HAB. Moist clay banks, Eastern slope of the United States; common.

2. **P. brachyphyllum,** Beauv. Plants densely gregarious, olive-green or dark brown when old, arising from a radicular prothallium; stem rigid, very short, 2 or 3 m.m. long: leaves close, the lower very small, squamiform, discolored, the upper much larger, 2 or 3 times longer than the stem, open-spreading, the upper erect, enlarged at the clasping base, oblong-lanceolate, blunt at the apex, the borders entire; lamellæ inflated on the border: calyptra villous, dirty brown, reaching the middle of the capsule: capsule thick, gibbous, ovate, with a distinct short neck, papillose, yellowish brown, obscurely costate when dry; pedicel solid, dark red, twisted to the right; lid convex-conical, obtusely apiculate. — Prodr. 84; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 211; Sulliv. Icon. Musc. 77, t. 48. *Polytrichum brachyphyllum*, Michx. Fl. Bor.-Am. ii. 295; Schwaegr. Suppl. ii. 2. 15, t. 156; Lindb. l. c. 142.

HAB. Moist clay banks, New Jersey and Southern States; not rare.

3. **P. capillare,** Brid. Plants short, gregarious or loosely cespitose, glaucous-green; stems slender, mostly simple or loosely foliate: lower leaves distant, small, appressed, gradually longer upward, the comal large, linear from a short sheathing base, sharply serrate on the borders; lamellæ abruptly enlarged at the borders: male plants smaller: calyptra hairy, covering the capsule to the base: capsule oblong-cylindrical, erect, papillose, thin, on a slender flexuous and comparatively long pedicel; lid hemispherical at the enlarged base, abruptly straight-beaked. — Bryol. Univ. ii. 127; Sulliv. Musc. Allegh. n. 115, and Icon. Musc. 79, t. 49. *Polytrichum capillare*, Michx. l. c. 294; Lindb. l. c. 111 and 136. *Pogonatum urnigerum*, Drumm. Musc. Amer. n. 284, in part.

HAB. Northern mountains; White Mountains, Adirondacks, Rocky Mountains, etc.

4. **P. dentatum,** Brid. Closely resembling the last species, from which it differs only in the more robust branching stems, the longer capsule with straight not flexuous pedicel, the teeth of the leaves longer, curved outward or backward, the perichætial leaves numerous (5 or 6), linear-lanceolate, long-pointed above the long ovate sheathing base, and the perigonial leaves

shorter. — Bryol. Univ. ii. 122; Sulliv. Icon. Musc. Suppl. 57, t. 41. *Polytrichum dentatum*, Menz. Trans. Linn. Soc. iv. 80, t. 7, fig. 4; Schwaegr. Suppl. ii. 2. 11, t. 155. *Polytrichum capillare*, var. *oxycalyx*, Lindb. l. c. 137.

HAB. Northwest coast (*Nelson, Menzies*); Alaska (*Bischoff*).

From a comparison of specimens received from Hampe of the true *P. dentatum*, which exactly corresponds to Schwaegrichen's figures, it is evident that this species is closely related to *P. capillare*, if not a mere form of it. — (*Sullivant.*)

5. **P. contortum**, Lesq. Plants large, gregarious or loosely cespitose, glaucous-green above, brown below; stem simple or with an innovation from under the perichætium, loosely and irregularly foliate its whole length: leaves erect, open, twisted when dry, the lower short, gradually longer upward, all linear-lanceolate, scarcely enlarged at base, sharply serrate to the base; costa percurrent, sparingly dentate on the back; perichætial leaves similar: calyptra covering the whole capsule: capsule ovate, cylindrical or obovate, erect or somewhat curved, somewhat constricted under the orifice when dry; pedicel long, flexuous; lid convex at base, rostellate. — Mem. Calif. Acad. i. 27; Sulliv. Icon. Musc. Suppl. 58, t. 42. *Polytrichum contortum*, Menz. l. c. 78, t. 7, fig. 2; Schwaegr. Suppl. i. 2. 325, t. 96. *Pogonatum laterale*, Brid. Bryol. ii. 111. *P. dentatum*, Lesq. l. c., in part.

HAB. Alaska (*Kellogg*); northwest coast (*Menzies*); Columbia River (*Hall*); clay banks in dense shaded woods, near Crescent City, California (*Brewer*); Rocky Mountains (*Perry*).

6. **P. atrovirens**, Mitt. Stem simple and long: leaves spreading, subcrispate and incurved when dry, broadly lanceolate, acute from an enlarged appressed base, serrate on the borders nearly from the base, dentate on the back: capsule short-pedicellate, oblong, erect; lid convex, short-rostrate. — Journ. Linn. Soc. viii. 49.

HAB. Sitka (*Barclay*).

Differs from the last in the leaves more abruptly pointed, enlarged at the base and sheathing, with the basilar areolation more distinct.

§ 2. URNIGERA. *Stems long, divided above and dendroid.*

7. **P. urnigerum**, Beauv. Stems dividing by more or less numerous lateral innovations (2 to 10), all fertile: lower leaves very small, squamiform, the upper crowded, open, appressed when dry, linear-lanceolate, serrate from the slightly enlarged

sheathing base, glaucous-green or light brown; perichætial leaves longer-sheathing, narrower: calyptra descending to below the base of the capsule: capsule ovate-oblong, papillose, not deformed when dry; lid plano-convex, straight-beaked. — Prodr. 85; Bryol. Eur. t. 417. *Polytrichum urnigerum*, Linn. Sp. Pl. 1109; Lindb. l. c. 111 and 134.

HAB. Woods, on sandy ground; mountains and hilly regions.

Very variable, especially in the size and length of the stems. A variety from Alaska has very short stems, and a short oval capsule, with the aspect of the European *P. nanum*, Neck.

8. **P. alpinum,** Roehl. Loosely and irregularly cespitose; stems flexuous or erect, black, triangular: leaves open, recurved or subsecund, from a white shining long-sheathing base, long and narrowly linear-lanceolate, concave, sharply reddish-dentate, spinulose on the back near the apex: capsule long-pedicellate, cernuous or inclined, turgid-ovate or oblong, with a short spurious neck, yellowish green when filled, ferruginous when empty; lid small, with a long oblique beak; teeth very irregular. — Deutschl. Fl. ed. 2, iii. 59; Bryol. Eur. t. 418. *Polytrichum alpinum*, Linn. l. c.; Lindb. l. c. 110 and 129.

Var. **arcticum,** Brid. Plants slender, less divided: capsule longer, cylindrical, subarcuate. — Bryol. Univ. ii. 131. *P. arcticum*, Roehl. *Polytrichum sylvaticum*, Menz. l. c. 83, t. 7, fig. 6.

Var. **septentrionale,** Brid. l. c. Stems sparingly foliate: leaves shorter, subsecund: capsule erect, ovate-globose. — *P. septentrionale*, Roehl.

Var. **brevifolium,** Brid. l. c. Stems erect; branches few and short: leaves densely crowded, imbricate, short, rigid, yellowish green: capsule very small, globose or larger and oval-globose. — *Polytrichum brevifolium*, R. Brown, App. Parry's Voy. Suppl. 294.

Var. **simplex,** Schimp. Very small; stem simple, scarcely 1 c.m. long: leaves short, imbricate, erect when dry: capsule short-pedicelled, ovate or subglobose. — Syn. 442.

HAB. Wet rocks and shady grassy banks, in mountains.

97. POLYTRICHUM, Linn. (Pl. 3.)

Plants growing in wide and large tufts, from radiculose creeping shoots. Stems erect, simple, woody, triangular, the male continuous from the middle of the flowers. Leaves as in

Pogonatum, with a broad costa; lamellæ numerous, not inflated at the borders. Calyptra covered with long hanging hairs. Capsule on a long solid pedicel, quadrangular or rarely hexagonal, with a short subglobose or discoidal apophysis. Lid large, plano-convex or conical, straight-beaked. Teeth of the peristome generally 64. Spores very small.

* *Capsule hexagonal.*

1. **P. gracile**, Menz. Plants densely cespitose; stems erect, slender, very flexuous at the tomentose divided base, simple above: leaves long, linear-lanceolate, sharply acuminate; borders thin, erect, acutely dentate: capsule erect on a long pedicel, horizontal when dry, hexagonal-ovate, covered by the calyptra nearly to the base; lid long-rostrate from a conical base, straight or oblique; peristome of 64 unequal teeth. — Trans. Linn. Soc. iv. 73, t. 6, fig. 3; Bryol. Eur. t. 421.

Hab. Peat bogs of Northern Ohio (*Lesquereux*); Lake Superior (*Agassiz*); Rocky Mountains (*E. Hall*).

2. **P. formosum**, Hedw. Loosely cespitose; stems long, sometimes very long, erect from the prostrate base: lower leaves very small, membranaceous, sheathing, open at the apiculate point, the upper open and recurved from a long sheathing and shining whitish base, glaucous-green above, loosely appressed when dry, long linear-lanceolate; margins erect, sharply dentate to near the clasping base; perichætial leaves very long, erect: calyptra descending to the base of the capsule: capsule on a long fleshy pedicel, erect when moist, cernuous when dry, horizontal when empty, hexagonal or triangular, with a distinct apophysis; lid conical at base, gradually long-acuminate, red on the borders. — Spec. Musc. 92, t. 19; Bryol. Eur. t. 420. *P. attenuatum*, Menz. l. c. fig. 2; Lindb. Polytrich. 109 and 126.

Var. **pallidisetum**, Bruch & Schimp. Stems shorter: leaves shorter and bright green: capsule narrower, often subcylindrical; pedicel yellow, reddish at base only.

Hab. Woods, in mountain regions; the variety in subalpine regions.

* * *Capsule quadrangular.*

3. **P. piliferum**, Schreb. Loosely cespitose; stems simple, from radiculose subterranean creeping shoots, erect, naked below: lower leaves very small, appressed, scarcely visible, the

upper abruptly larger, crowded, glaucous-green, imbricate when dry, ovate, sheathing, long-lanceolate at base, nearly erect towards the apex by the inflexion of the entire borders; costa prolonged into a long white dentate awn; perichætial leaves linear-lingulate, erect, very concave, the inner thin; costa round, without lamellæ, the awn very long: calyptra descending below the capsule: capsule tetragonal-ovate, erect, cernuous when dry; lid depressed, conical at base, short-rostrate, purple or orange; teeth regular. — Spicil. Fl. Lips. 74; Bryol. Eur. t. 422.

Var. **Hoppei**, Rabenh. Stems very densely cespitose, short: leaves subimbricate when wet, shorter, with a very long awn: capsule on a short thick pedicel, square or subcubical, orange, always erect.

HAB. Sandy barren ground; plains and mountains. The variety in the Rocky Mountains (*Downie*).

4. **P. juniperinum**, Willd. Plants long, erect from subterranean shoots, simple, dichotomous above: leaves spreading-open when moistened, erect when dry, glaucous or dirty green, long linear-lanceolate from the enlarged sheathing base, entire, inflexed on the borders; costa excurrent into a short reddish brown serrulate awn; perichætial and perigonial leaves membranaceous on the borders; lamellæ papillose on the margins: capsule entirely covered by the calyptra, tetragonal-prismatic, solid, reddish orange, becoming brown when old; lid plano-convex at base, apiculate, reddish. — Fl. Berol. 305; Hedw. Spec. Musc. 89, t. 18; Bryol. Eur. t. 423.

Var. **alpinum**, Schimp. In compact tufts; stems shorter: leaves shorter, more crowded, imbricate when dry, the perichætial long-curved: calyptra shorter, white: capsule shorter, short-pedicellate. — Syn. 447.

HAB. Barren and dry meadows; plains and mountains. The variety in high mountains.

5. **P. strictum**, Banks. Plants slender, densely cespitose, branching; tufts matted with a dense whitish tenacious tomentum: leaves erect-open, strict, imbricate when dry, shorter and narrower than in the last: capsule smaller, acutely angled, red-orange, covered entirely by the villous calyptra. — Menz. Trans. Linn. Soc. iv. 77, t. 7, fig. 1. *P. alpestre*, Hoppe. *P. juniperinum*, var. *strictum*, Wallm., and var. *alpestre*, Bruch & Schimp. Bryol. Eur. t. 424; Sulliv. Mosses of U. States, 42.

HAB. Mountains, on dry rocks; White Mountains, etc.

6. **P. commune,** Linn. Plants very large, loosely cespitose, dark red: leaves open, recurved, very long-sheathing, membranaceous, whitish at base; borders narrow, sharply and densely serrate to the enlarged base; borders of the lamellæ papillose; perichætial leaves erect, very long-sheathing, awned: calyptra very hairy, descending below the capsule: capsule sharply angled, long-pedicellate, light brown, horizontal when dry and empty; lid flattened-convex at base, conical-apiculate, with red borders. — Spec. Pl. 1109; Bryol. Eur. t. 425.

Var. **perigoniale,** Bruch & Schimp. Smaller, often bifid: perichætial leaves all membranaceous, long-aristate: lid pale, short-apiculate. — *P. perigoniale,* Michx. Fl. Bor.-Am. ii. 293.

Hab. Bogs and woods; plains and mountains. June. Very variable.

Tribe XV. BUXBAUMIEÆ.

Small stemless plants, with large oblique ventricose capsules, sessile or with short thick pedicels. Calyptra very small, conical, smooth. Sporangium pedicellate, small, attached by filaments to the walls of the capsule. Peristome double, the outer rudimentary, or composed of one or more rows of more or less perfect teeth, the inner membranaceous, and forming a truncate cone of 16 or 32 twisted folds. Spores very small.

98. DIPHYSCIUM, Mohr. (Pl. 3.)

Stems very short, simple, with numerous long radicles. Stem-leaves lingulate, thick, composed of a double stratum of cells, costate, chlorophyllose; areolation very small, round-hexagonal; perichætial leaves larger, ovate-lanceolate, thin, submembranaceous, deeply serrate or lacerate-ciliate at the apex; costa excurrent into an awn. Flowers dicœcious; the male open, on plants similar to the fertile ones, the paraphyses longer than the antheridia; the female gemmiform, with paraphyses shorter than the long-styled archegonia. Vaginule formed of the thickened upper part of the stem, bearing the perichætium. Calyptra acute-conical, covering the lid. Capsule ventricose, ovate-conical, yellowish green. Lid conical, acute. Outer peristome

formed on an annulus with sixteen notches representing teeth more or less distinctly.

1. **D. foliosum,** Mohr. Widely cespitose, dark green: stem-leaves crenulate on the borders by prominent cells, crispate when dry: capsule immersed in the colorless perichætium; teeth of the outer peristome very short, triangular, granulose, transversely articulate, often perforated in the middle, pale yellow, purple at the apex. — Obs. Bot. 34; Bryol. Eur. t. 428 and 428[b]. *Buxbaumia foliosa*, Web. Fl. Gott. 128. *Webera sessilis*, Lindb. Öfv. Vet. Akad. Forh. xxi. 576.

Hab. Clayey and shady sandy banks, along roads.

99. BUXBAUMIA, Hall. (Pl. 3.)

Plants very small, gregarious, growing on soil or decaying wood. Lower leaves broadly ovate or ovate-lanceolate, the upper ovate and linear-oblong, without costa, coarsely dentate-ciliate on the borders by prominent cells; areolation loose, oblong-hexagonal, not chlorophyllose, pale near the base, reddish or orange-colored toward the apex, irregular when young; basilar cells transformed into laciniæ or long brown filaments, becoming roots and covering the stem and vaginule with a very thick tomentum. Flowers dicœcious; male plants smaller than the fertile, with a few thin leaves not laciniate when old; antheridia solitary or in pairs, with few paraphyses; perigynium of the fertile flowers ovate-oblong, of 9 to 12 leaves, becoming lacerate after fecundation; archegonia 1 to 3, with few short paraphyses; perichætial leaves very irregular, ramose-ciliate after fecundation. Vaginule thick, fleshy, formed of the perichætial part of the stem. Calyptra conical, cylindrical, obtuse, covering the lid only, detached before the maturity of the fruit, sometimes slightly split on one side. Capsule on a thick red densely verrucose pedicel, oblique on a solid erect neck, ovate or ovate-oblong, ventricose, flattened on one side. Lid conical-cylindric, obtuse. Peristome double, the outer either imperfect and adherent to the annulus, or perfect, formed of a double or triple series of teeth, the inner like that of *Diphyscium*.

Annulus narrow or very large, forming a solid irregularly erose dentate margin (outer peristome of authors).

1. **B. aphylla,** Linn. Annulus very broad, as high as the middle of the inner peristome; outer peristome composed of pale irregular segments, slightly exceeding the annulus; outer wall of the capsule detached below the orifice after the fall of the lid, laciniate and revolute. — Amœn. Acad. v. 83, t. 1; Bryol. Eur. t. 427 and 428[b].

Hab. On the ground, especially of granite regions and mountains; White Mountains; Cascade Mountains, etc. (*Lyall*).

Series II. CLADOCARPI.

Flowers terminal at the apex of short lateral branches.

Tribe XVI. FONTINALEÆ.

Aquatic mosses, with stems more or less branching, bearing radicles at their base only. Leaves three-ranked, thin, smooth, ecostate; reticulation slightly chlorophyllose; perichætial branches short, transformed at the apex into a vaginule; perichætium densely imbricate, sheathing. Calyptra conical or cucullate, naked. Capsule sessile, emersed. Peristome double, the outer of 16 long teeth, transversely articulate, latticed on the inside, the inner of 16 cilia united into a 16-carinate cone, latticed by transverse partitions.

100. FONTINALIS, Dill. (Pl. 4.)

Plants floating in water, generally long. Stem irregularly branching or fasciculate-ramose. Leaves very concave or acutely carinate, with a narrowly rhomboidal or vermicular areolation generally enlarged at the auriculate base. Flowers diœcious, small, with few antheridia, archegonia and paraphyses. Annulus none.

1. **F. antipyretica,** Linn. Leaves broadly ovate, acuminate, entire, sharply carinate-plicate; borders reflexed on one side toward the angular slightly auricular loosely areolate base, green when young, olive-color or blackish and often split along the keel when old; areolation long hexagonal-rhomboidal;

perichætial leaves imbricate, the upper enlarged, oblong, all very obtuse at the apex, often lacerate: capsule ovate-oblong, solid, olive-green, fuscous when empty; lid conical; teeth long, dark purple, twisted inward when dry; articulations close, 26 to 30; cone blood-red; partitions ciliate. — Sp. Pl. 1107; Bryol. Eur. t. 429. *Pilotrichum antipyreticum*, Muell. Syn. ii. 148.

Var. **gigantea**, Sulliv. More robust and less divided: leaves larger, more closely imbricate, generally shining, pale green or golden yellow, reddish when young, gradually smaller toward the end of the branches: capsule smaller, less solid; teeth shorter; cone less regularly latticed. — Icon. Musc. 106, t. 66. *F. gigantea*, Sulliv. in Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 224. *F. Eatoni*, Sulliv. l. c., n. 224[c].

HAB. Shallow creeks; not common. The variety in rivulets of the plains and in mountain streams; very common.

2. **F. Californica**, Sulliv. Stems very soft and much divided, all foliate: leaves open, concave, distant, broadly oval, loosely areolate; primordial utricles of the cells not quite dissolved: fruit unknown. — Pacif. R. Rep. iv. 189.

HAB. Rivulets in the Coast Ranges north of the Bay of San Francisco (*Bigelow*).

Resembling *F. antipyretica*, var. *gigantea*, but a somewhat smaller plant, with more distant spreading shorter broader and less acuminate leaves, with a loose areolation of shorter and wider cells, in which the primordial utricle is more or less conspicuous; color reddish brown or copperish.

3. **F. Neo-Mexicana**, Sulliv. & Lesq. Rigid, yellowish or dirty green, shining when dry; stems much divided with long branches, naked below: leaves open-erect, oblong-lanceolate, more or less plicate; cells of the areolation narrow, thick-walled, those of the subauriculate decurrent base enlarged, oblong, ferruginous; upper perichætial leaves ovate-oblong, abruptly cuspidate, upper areolation linear, and base of the leaves marked with reddish orange lines: male plants more slender; perigonial leaves numerous: capsule ovate-oblong, smaller than in *F. antipyretica*; lid conical, obtuse; teeth with 20 articulations; cone latticed and papillate. — Musc. Bor.-Amer. Exsicc. n. 224[b]; Aust. Musc. Appal. n. 251[b]; Sulliv. Icon. Musc. Suppl. 76, t. 57. *F. antipyretica*, var., Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. (ed. 2), n. 334. *F. Mercediana*, Lesq. Proc. Calif. Acad. i. 28.

Hab. Mountain rivulets of New Mexico (*Wright*), sterile specimens upon which the species was founded; Merced River, California (*Bolander*), fertile; Rocky Mountains, also fertile (*E. Hall*).

4. **F. Dalecarlica,** Bruch & Schimp. Plants fasciculately ramose, naked toward the base, dark or dirty green: leaves closely imbricate, narrowly oblong-lanceolate, acuminate, glossy concave and incurved on the borders; perichætial leaves longer-acuminate, the inner surpassing the top of the lid, recurved at the apex: teeth distantly articulate, lacunose between the articulations; cilia irregularly latticed, mostly disjointed, yellowish. — Bryol. Eur. t. 431. *F. squamosa*, Auct.; Sulliv. Mosses of U. States, 54.

Hab. Mountain rivulets; not rare, and abundantly fruiting.

5. **F. biformis,** Sulliv. Plants yellowish green when young, dirty green when old; stems long, very ramose: leaves loosely imbricate, indistinctly three-ranked, dimorphous, the vernal large, soft, broadly ovate-lanceolate, concave, acute or blunt; the later, after the falling off of the first, much smaller and narrower, convolute, rigid, covering the young branches; areolation of the vernal leaves linear in the middle, broader-rhomboidal and sphagniform near the apex, that of the small decurrent basal auricles much larger, quadrate-oblong: female flowers very rare, placed at the base of the stems, the male long-stipitate, clustered (2 to 4): calyptra long-conical, lacerate at base: capsule oblong-oval, closely folded among the perichætial leaves, generally erose at the apex when old; lid conical, rostrate; teeth linear-lanceolate, 18–20-articulate; cilia tessellate and united at the apex only, granulose and papillose like the teeth. — Mosses of U. States, 54, in part, and Icon. Musc. 99, t. 59, 60; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 226, 226[b] and 226[c] *F. disticha*, var., Sulliv. Musc. Allegh. n. 191, and *Pilotrichum sphagnifolium*, Muell. Syn. ii. 150; a vernal form. *F. disticha*, var., Sulliv. l. c., n. 192, and *Pilotrichum distichum*, Muell. l. c., in part; the summer form.

Hab. Woodlands, in rivulets; Central Ohio.

Besides other characters less striking, such as the rostrate operculum, the long-stipitate male flowers, etc., the prominent peculiarity of this species is the change which takes place in its foliage, the vernal leaves being replaced in summer by others of a different size, form and texture.

6. **F. Novæ-Angliæ,** Sulliv. Somewhat like the vernal forms of the last species, differing in the more rigid elastic

stems, distantly and pinnately branched at right angles; branches short: leaves close, firm, generally bright green, densely areolate, not dimorphous: male flowers solitary, the female very numerous in the axils of most of the leaves: capsule and peristome as in *F. biformis;* cilia less papillose. — Mosses of U. States, 104, and Icon. Musc. 105, t. 65.

Hab. New Haven, Connecticut (*Eaton*); Massachusetts (*Ingraham, James*); Rhode Island (*Olney*); Catskill Mountains, New Jersey, etc.

7. **F. Lescurii,** Sulliv. Plants green, passing to glossy gold-color; stems long, loosely foliate, irregularly branching, subpinnately ramulose toward the apex: leaves open-erect, obscurely three-ranked, long-lanceolate, concave, soft, clasping at base, slightly serrulate at the apex; medial cells very narrow, flexuous, linear, the apical shorter and broader, those of the basilar angles much larger, oblong, inflated: flowers numerous toward the base of the plants: capsule short, subcylindrical, thin, covered before maturity to above the operculum by the inner oblong-obtuse tubulose perichætial leaves, closely enfolding it, becoming shortened by erosion when old; lid long-conical; teeth granulose-papillose, of 20 to 25 articulations; cilia trabeculate and connected at the apex, free and appendiculate at base. — Mosses of U. States, 54, and Icon. Musc. 101, t. 61; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 228.

Var. **gracilescens,** Sulliv. Smaller and more slender, resembling *F. disticha.* — Icon. Musc. 101.

Hab. Falls of Little River, Lookout Mountains, Alabama (*Lesquereux*); Saco River, in the White Mountains (*James*); Oregon (*Hall*). The variety in New Hampshire, Rhode Island, New Jersey, Delaware, etc.

8. **F. Sullivantii,** Lindb. Much like *F. Lescurii*, the plants slender and smaller: leaves distant, narrower, dirty yellow; basilar cells very large; perichætial leaves shorter, not undulate at the apex: capsules numerous, cylindrical, shorter and broader; lid longer. — Öfvers. Finska Vet. Soc. xii. 77. *F. Lescurii*, var. *ramosior*, Sulliv. Icon. Musc. 101, t. 62.

Hab. Cheshire County, New Hampshire (*Eaton*), and Brattleborough, Vermont (*Frost*).

9. **F. filiformis,** Sulliv. & Lesq. Ms. Plants very slender, much divided; stems and branches filiform, flexible: leaves convolute, narrow, rigid, loosely areolate; primordial cells more or less dissolved: capsules very numerous, long-cylindrical;

teeth lanceolate-subulate, obscurely 20–22-articulate, scarcely perforated on the divisural line, the inner generally destroyed to near the base, appendiculate, closely articulate. — *F. disticha*, Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. (ed. 2), n. 227. *F. disticha*, var. *tenuior*, Sulliv. Icon. Musc. 103, t. 64.

Hab. Old bayous, Western Kentucky (*Lesquereux*).

A well marked species, generally confounded with *F. disticha*, but readily distinguished by its slender delicate habit and its long and narrow capsule.

10. **F. disticha**, Hook & Wils. Plants more robust than in the last, more divided and diffuse, or pinnately branching above: leaves more open, broader, concave, twisted at the slightly serrulate apex; perichætial short and lacerate: male flowers very numerous: fruits rare: capsule somewhat broader; teeth 12–16-articulate; the cilia transversely latticed from the middle upward. — Drumm. Musc. Amer. (Coll. II.), n. 151; Sulliv. Musc. Allegh. n. 190, Mosses of U. States, 54, and Icon. Musc. 103, t. 63.

Hab. New Orleans (*Drummond*); Mobile (*Sullivant*).

11. **F. hypnoides**, Hartm. Plants slender, with few branches and short spreading branchlets: stem-leaves distant, open, nearly flat, ovate-lanceolate, sharply long-acuminate, narrowly lanceolate when young, loosely reticulate: capsule very small, elliptical, thin, naked to the middle; teeth narrow, densely articulate, entire, purple; cilia narrowly latticed, blood-red. — Skand. Fl. ed. 4, 434; Bryol. Eur. t. 432.

Hab. Colorado. Included in Rau & Hervey's Catalogue upon sterile specimens sent to the authors by *Brandegee*.

101. DICHELYMA, Myrin. (Pl. 4.)

Plants with distant subdistichous branches. Leaves narrow, long lanceolate-subulate, falcate or complicate, narrowly costate; areolation rhomboidal. Flowers diœcious; perichætium very long, the outer leaves imbricate, the upper convolute. Calyptra dimidiate, descending to below the capsule and connate at base, or short and cucullate. Capsule long-pedicellate. Teeth of the outer peristome long-linear, more or less densely articulated, and splitting along the divisural line; cilia longer than the teeth, latticed above or appendiculate.

1. **D. falcatum,** Myrin. Stems variable in length: leaves close, three-ranked, falcate-secund, entire or nearly so, bright green when young, then yellowish-glossy, blackish and opaque when old; costa subpercurrent; inner perichætial leaves very long, thong-shaped, twisted around the pedicel: calyptra closely enfolding the pedicel under the capsule, split open on one side, pale straw-color: capsule oval-oblong, exserted on a slender pedicel; lid as long as the capsule, conical-acuminate; inner peristome finely latticed, bright red. — Svensk. Acad. Handl. 1832, 274, t. 6; Bryol. Eur. t. 433. *Fontinalis falcata,* Hedw. Musc. Frond. iii. 57, t. 24.

Hab. Swift mountain streams; White Mountains, Catskills, Adirondacks, etc.

2. **D. uncinatum,** Mitt. Leaves three-ranked, falcate-secund, lanceolate, gradually narrowed to the denticulate apex, complicate costate; borders minutely serrulate from the middle upward; outer perichætial leaves convolute, oblong, obtuse, the inner longer, more acute: capsule exserted, on a short pedicel, oval, subequal; lid as long as the capsule, subulate: inner peristome entirely latticed, a little longer than the outer. — Journ. Linn. Soc. viii. 44.

Hab. Fort Colville, Washington Territory (*Lyall*).

Closely allied to *D. falcatum,* from which it differs in the more slender and more distinctly pinnately branched stems, and the more setaceous leaves with an excurrent costa, which is smooth beyond the serrulate margins, and denticulate only at its apex. The perichætial leaves are not twisted, and the inner peristome is a perfectly cancellate cone, exceeding the outer teeth by about one-fifth of their length. — (*Mitten.*)

3. **D. capillaceum,** Bruch & Schimp. Of the same size as the last; branches distichous, few, divaricate, or one-sided: leaves secund, less falcate, oval-lanceolate at base, long-linear above, acuminate by the excurrent costa, serrate at the apex, dirty green; perichætium very long, passing above the capsule; perichætial leaves linear, thin, ecostate, pale yellow, twisted: capsule emerging from the side of the perichætium, small, thin, pale, ovate, truncate after the falling off of the high conical lid; teeth narrowly linear, densely papillose; cilia nearly as large, longer than the teeth, constricted at the articulations, united only near the apex by transverse divisions, papillose, pale yellow. — Bryol. Eur. t. 436. *Fontinalis capillacea,* Dicks. Crypt. Fasc. ii. 1. *Neckera capillacea,* Muell. Syn. ii.

144. *D. capillaceum*, var. *subulifolium*, Bruch & Schimp. Bryol. Eur. t. 435, in part (β 1, 2, 2a).

HAB. In valley rivulets, Pennsylvania and the Northwest; not rare.

4. **D. pallescens**, Bruch & Schimp. Resembling the last in its long perichætium, but differing from it in its pale green color, the shorter and less divided stems, the shorter wider more complicate-carinate nearly entire and closely areolate leaves, the costa percurrent or vanishing below the apex, and the cilia simple, narrower, and not barred. — Bryol. Eur. under t. 436; Schimp. Corol. 97. *D. capillaceum*, Myrin, l. c. t. 7; Bryol. Eur. t. 435, excl. var.

HAB. Rocky Mountains (*Drummond*); stagnant pools, New England (*Ingraham*); Pennsylvania and Nova Scotia (*James*).

5. **D. subulatum**, Myrin, l. c. Tufts long, pale, loose; stems slender, flaccid, pinnately divided into short open unequal branches: stem-leaves open, distant, loosely imbricated, slightly secund, lanceolate, plicate-concave, denticulate at the apex; costa narrow, vanishing below the apex; perichætial leaves imbricate, long-lanceolate, ecostate, very entire: calyptra short, cucullate, covering the lid only: capsule oval, immersed; lid convex, obliquely rostellate; teeth short, lanceolate, split open, minutely punctulate, saffron color; cilia thin, much longer than the teeth, nodose and appendiculate below, trabeculate and united at the apex only, smooth, reddish brown. — Bryol. Eur. t. 434. *Fontinalis subulata*, Beauv. Prodr. 58. *Neckera subulata*, Muell. Syn. ii. 145.

HAB. Georgia (*Beauvois*); Louisiana (*Drummond*); Arkansas (*Engelmann*).

6. **D. cylindricarpum**, Aust. Stem-leaves lanceolate-subulate, twisted, falcate, very entire or serrulate at the apex only; costa round, long-excurrent; perichætial leaves somewhat twisted, obtuse: capsule cylindrical, yellowish, exserted on a pedicel two c.m. long, somewhat irregular and slightly costate when dry; lid conical, acute; teeth long, solid, opaque, papillose; cilia slightly longer, cancellate their whole length, papillose. — Coult. Bot. Gaz. ii. 111.

HAB. Oregon (*Mrs. Jessie Roy*).

The author compares it with *D. uncinatum*, from which it is distinguished by the capsule twice as long and much longer pedicelled, the outer peristome longer and papillose, the stem-leaves with the costa more distinctly excurrent into a narrower more acute terete point, etc.

7. **D. Swartzii**, Lindb. Ms. With the habit of *D. capillaceum*, but more robust: upper leaves of the branches hooked, the others variously secund, all densely crowded, obscurely three-ranked, glossy, lanceolate at base, gradually narrowed into a very long flat acumen, acutely serrate at the apex, distantly denticulate below; costa vanishing below the point: fruit unknown. — Schimp. Syn. 461. *Hypnum fluitans*, var. *serratum*, Lindb.; Hartm. Skand. Fl., ed. 9, 18. *H. exannulatum*, Guemb., vars. *immersum* and *Cochleæ*, Austin, l. c. 143.

Hab. Pools of stagnant water, New Jersey (*Austin*); California (*Bolander, Brewer*).

The species resembles *Hypnum fluitans*, and has been considered by Schimper as probably a variety of that species. It is distinct, however, in the narrow cells of the leaves, the two basilar rows much longer and somewhat broader, and in the denticulation entirely surrounding the leaf. The species is evidently diœcious. The male plants received from California are covered with large polyphyllous flowers, with the perigonial leaves broadly ovate, concave, and narrowed into a long slender flexuous nearly entire point.

Series III. PLEUROCARPI.

Fruit lateral by the position of the flowers of both kinds, placed in the axils of leaves, either upon the primary stems or upon branches.

Tribe XXIX. NECKEREÆ.

Primary stems creeping, generally defoliate; the secondary erect or pendent, dichotomous or fasciculately or pinnately ramulose. Leaves spreading, generally large, smooth, rarely obscurely papillose, minutely areolate; upper cells rhomboidal, or short-linear in oblique rows, the lower long-linear, angular or minutely quadrate. Fruit on perichætial branchlets without rootlets at base. Calyptra conical or cucullate, naked or hairy. Capsule generally immersed in the long imbricate perichætium, erect, symmetrical, rarely curved. Peristome simple or double, very rarely none.

102. CRYPHÆA, Mohr. (Pl. 5.)

Secondary stems more or less regularly pinnate or bipinnate. Leaves spreading when moist, imbricate when dry, ovate, acu-

minate; costa vanishing below the apex; areolation minute, round-oval above, longer toward the base. Flowers monœcious, numerous; perichætia on short branches, often agglomerate, the perichætial leaves very different from those of the stem, with a linear vermicular areolation, hexagonal-rectangular at base. Calyptra conical-campanulate, many times split at the base, rough or papillose. Capsule immersed, subtruncate at base, ovate, thin. Peristome double; outer teeth linear-lanceolate, articulate, minutely papillose; segments narrow, linear or filiform, punctulate; cilia none. Annulus large, compound.

1. **C. glomerata,** Bruch & Schimp. Plants small, rigid, in loose flat yellowish green tufts; primary stems naked when old, the secondary julaceous, simple or rarely branching: leaves close, imbricate, ovate-elliptical, abruptly short-acuminate, concave, reflexed on the borders, densely areolate; medial and upper cells elliptical, longer toward the base, the marginal smaller and subquadrate; costa reaching to the middle; lower perichætial leaves minute, ovate, the upper gradually becoming much larger than the inner, oblong, abruptly rounded at the apex, thin, the costa excurrent into a thick point: male flowers gemmiform: calyptra 2–3-laciniate at base, split nearly to the top on one side, scabrous at the apex: capsule oval-oblong, thin, very shortly pedicellate; lid obliquely conical, acute; peristome whitish; segments short; annulus compound, very broad.—Bryol. Eur. under *Cryphæa*, 5; Sulliv. Mosses of U. States, 56, t. 5, and Icon. Musc. 107, t. 67. *C. filiformis*, Sulliv. Musc. Allegh. n. 81. *Daltonia heteromalla*, Hook. & Wils. in Drumm. Musc. Amer. (Coll. II.), n. 99.

Hab. Trunks of trees, mostly in the Southern States; not rare.

2. **C. pendula,** Lesq. & James. Plants slender, loosely pendent, dark brown, green in the upper part only; primary stems very short or scarcely seen, the secondary filiform, thicker in the middle, branching at the apex only; branchlets capilliform, either long and forking, or short, multiple and flagellate: leaves squarrose-spreading when moist, long-acuminate; areolation dense; apical cells ovate, angular, the alar transversely elongated, quadrangular; costa short, vanishing below the middle, sometimes forking at base; perichætial leaves with a short

acumen, the solid costa vanishing at or below the apex: calyptra conical, entire: capsule and peristome as in the preceding species; lid conical, blunt at the apex. — Proc. Amer. Acad. xiv. 138.

HAB. On Tillandsia, Florida (*J. Donnell Smith, Garber*).

The dark color of the plants, the long flexuous slender filiform stems, rarely simple, generally forking above the middle or divided in tufts of short capillary flabellate branches, the form and disposition of the longer leaves, open or recurved at the top when dry, the areolation, the straight conical operculum, and the entire calyptra hispid to below the middle, are the essential characters which separate this species from the last.

3. **C. nervosa,** Bruch & Schimp. l. c. Differs from *C. glomerata* in its more slender stems, leaves less crowded, narrower, lanceolate-acuminate, the costa ascending to near the apex or vanishing within the acumen, the upper perichætial leaves lanceolate, and papillose on the back near the apex: calyptra split on one side only: capsule turgid at base, shorter; annulus simple, shorter, nearly smooth. — Sulliv. Mosses of U. States, 56, and Icon. Musc. 109, t. 68. *Daltonia nervosa*, Hook. & Wils. in Drumm. Musc. Amer. (Coll. II.), n. 100.

HAB. On trees; Louisiana (*Drummond*); Alabama (*Robinson*). Often mixed with the preceding.

4. **C. Ravenelii,** Aust. Plants short, dirty green, julaceous, curved, nearly simple: leaves open when moist, round-ovate, obtuse or blunt, opaque, minutely papillose on the back; borders slightly recurved toward the base, incurved at the apex; costa ascending to above the middle, flexuous and open, unequally bifid at the apex; areolation obscure, minutely granulose, uniform: fruiting branches very short; perichætial leaves thin, pale, abruptly short-acuminate; costa slender, vanishing far below the apex: capsule oval, solid, surrounded at the orifice by a broad solid red margin; lid conical, acute; teeth 8, red, solid, subulate-filiform from the enlarged base, nodulose-articulate, perforated along the dividing line; segments none. — Coult. Bot. Gaz. ii. 89.

HAB. Rome, Georgia (*Ravenel*).

Resembles *C. glomerata*, but is readily distinguished by its obtusish granulose leaves, not squarrose when moist, by its shorter less abruptly pointed perichætial leaves, not costate to the apex, by its shorter more solid capsule, with a broad solid rim and without a persistent annulus, by its red erect teeth, appressed when moist, and by the want of an inner peristome. — (*Austin.*) Apparently referable to the following genus.

103. LEPTODON, Mohr. (Pl. 4.)

Stems short, depressed, pinnately or irregularly divided into short branches. Leaves obtuse, opaque, smooth or slightly papillose on the back, loosely imbricate. Flowers monœcious. Vaginule distinct, covered with long hairs. Calyptra hairy. Capsule subincluded, oval-oblong, soft. Lid rostrate. Peristome simple, of 16 teeth.

1. **L. trichomitrion,** Mohr. Plants rigid, in broad yellowish green tufts; primary stems creeping, filiform, naked, the secondary short, with numerous short branches: leaves close, open-erect, ovate-lanceolate, acuminate to a blunt point, concave, reflexed on the borders; cells oblong, fusiform, smaller and quadrate along the borders near the base; perichætial leaves of loose texture, the upper long, sheathing, narrowly acuminate, passing above the base of the capsule: capsule cylindrical-ovate, gradually narrowed to a short pedicel, thin; teeth linear-lanceolate, whitish, remotely articulate, sometimes perforated along the dividing line; inner membrane entire or more or less lacerated, adhering to the inner face of the teeth. — Obs. Bot. 27; Sulliv. Musc. Allegh. n. 88, and Icon. Musc. 112, t. 71. *Pterigynandrum trichomitrion*, Hedw. Sp. Musc. 82, t. 16. *Lasia trichomitrium*, Beauv. Prodr. 72. *Forsstræmia trichomitria*, Lindb. Öfv. Svensk. Vet. Akad. xix. 605.

Var. **immersus,** Sulliv. Plants smaller: leaves broader; the perichætial shorter-acuminate: capsule subimmersed; teeth more densely articulate. — Icon. Musc. 112. *L. immersum*, Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 234; Sulliv. Mosses of U. States, 57.

Var. **irriguus,** Renauld Ms. Leaves spreading when moist; costa simple, ascending to above the middle: pedicel geniculate, exceeding the perichætial leaves; vaginule with few short hairs.

Hab. Trees, rarely on rocks; Northern and Middle States. The varieties in the Southern States, the last on wet rocks in Florida (*Fitzgerald*).

2. **L. Ohioensis,** Sulliv. More slender than the last; secondary stems julaceous, less divided: leaves shorter, broader, horizontally spreading when moistened; areolation nearly round; costa thick, vanishing above the middle: capsule and operculum shorter. — Musc. Allegh. n. 89, Mosses of U. States,

57, t. 4, and Icon. Musc. 114, t. 72. *Neckera Ohioensis*, Muell. Syn. ii. 93. *Forsstræmia Ohioensis*, Lindb. Öfv. Finsk. Vet. Soc. xii. 75.

HAB. Central Ohio, on trees in swampy woods; not rare.

3. **L. nitidus**, Lindb. Ms. Plants yellowish green, glossy; primary stems prostrate, with mere fragments of leaves, the secondary scarcely flattened, erect, or curved above, irregularly divided into short slender densely foliate round branches: leaves erect, imbricate, slightly auriculate at base and decurrent, broadly oblong-ovate, short-acuminate, serrulate at the apex only; costa short, vanishing below the middle; cells of the areolation narrowly rhomboidal, oblong-linear, chlorophyllose; those of the angles few, quadrate, inflated, small and brown; perichætial leaves linguiform, abruptly short-acuminate, ecostate, very entire: capsule immersed, oval-globose, with a dark purple margin, glossy, rugulose when dry; lid large, broadly conical, apiculate; teeth of the simple peristome linear-lanceolate, acuminate, pale brown, very brittle, densely trabeculate. — Sulliv. Icon. Musc. Suppl. 80, t. 60. *Neckera Macounii*, Sulliv. Canad. Nat. ser. 2, ii. 79 and 397, name only. *Forsstræmia nitida*, Lindb. l. c. 73.

HAB. On trees, near Belleville, Canada (*Macoun*).

104. ALSIA, Sulliv.

Habit and appearance of *Leptodon:* primary stems creeping, defoliate, rooting, the secondary erect, dendroid, pinnately or bipinnately divided; branches more or less curved downward or circinate when dry. Stem-leaves ovate-oblong, lanceolate, with multiform paraphyllia; areolation punctiform, oval-quadrate on the basilar borders. Flowers diœcious, the male numerous, on stems and branches. Calyptra cucullíform, smooth. Capsule generally short-pedicellate, cylindrical or oblong, erect or subcernuous, emerging from a long imbricate perichætium. Lid conical, curvirostrate. Peristome double; outer teeth linear-lanceolate, long; segments linear, filiform, nearly as long as the teeth, enlarged and carinate at the junction with the basilar membrane, articulate and perforated, with or without cilia. Genus allied to *Leptodon*.

1. **A. Californica,** Sulliv. Widely cespitose, bright green; secondary stems subpinnately divided: leaves loosely imbricate, oblong-lanceolate, spreading and divergent, concave, reflexed on the borders, flat at the apex, serrulate; costa vanishing in the middle; branch-leaves smaller; cells of the upper and middle portions round-rhomboidal, of the lower longer and pellucid, of the alar quadrate and obscure; upper perichætial leaves sheathing, filiform-acuminate; teeth distinctly trabeculate, yellowish inside, punctulate-scabrous; annulus none.—Proc. Amer. Acad. iii. 185, and Musc. Wilkes Exp. 25, t. 25. *Neckera Californica*, Hook. & Arn. Bot. Beechey, 162.

Hab. California, on trees (*Pickering, Bigelow, Bolander*, etc.); not rare.

2. **A. abietina,** Sulliv. Plants in wide rigid dark green tufts; secondary stems solid, elastic, simple at base, pinnately or subbipinnately branching above, frondiform, circinate when dry: branch-leaves five-ranked, imbricate, open-erect, ovate-lanceolate, obtusely acuminate, carinate-concave, papillose on the back and serrulate above, recurved on the borders toward the base; costa vanishing below the apex; perichætial leaves striate at base or excentrically costate to the middle: calyptra longer than in the last species: capsule oblong-ovate, thin, costate when dry, short-pedicellate; annulus compound, revoluble.—Icon. Musc. 115, t. 72[b]. *Neckera abietina*, Hook. Musc. Exot. t. 7; Schwaegr. Suppl. ii. 2. 154, t. 140. *Pilotrichum abietinum*, Brid. Bryol. Univ. ii. 258. *Leptodon circinatus*, Sulliv. Pacif. R. Rep. iv. 189, t. 1, male plant.

Hab. On trees, Northwest coast (*Menzies*); Vancouver Island (*Lyall*); California (*Bolander, Bigelow, Watson*).

3. **A. longipes,** Sulliv. & Lesq. Tufts soft, grayish green; secondary stems soft, pinnately and bipinnately branching from near the base, subcompressed: leaves oblong-lanceolate or linguiform, acute, coarsely serrate above, concave, plane on the borders; costa abruptly vanishing above the middle, denticulate on the back; perichætial leaves tubulose, abruptly narrowed and denticulate to a reflexed subulate apex: calyptra long, cylindrical; pedicel four times as long as the perichætium: teeth long, narrowly lanceolate; inner segments shorter, separated by 1 or 2 appendiculate cilia; annulus none.—Musc. Bor.-Amer. Exsicc. ed. 2, n. 399; Sulliv. Icon. Musc. Suppl. 85, t. 63.

Hab. On rocks in deep cañons, California (*Bolander*).

105. NECKERA, Hedw. (Pl. 5.)

Plants long, widely cespitose. Stems radiculose at base, erect or pendent; branches distichous, close or distant, often flagelliform. Leaves flat, generally undulate, glossy, pellucid; areolation minute, rhomboidal, oblong in the upper part, linear in the middle, quadrate on the borders. Capsule naked or slightly hairy. Peristome double; outer teeth long, linear-lanceolate and subulate, closely articulate, thin; inner membrane divided into filiform segments, subcarinate at base; cilia and annulus none.

* *Capsule immersed.*

1. **N. disticha,** Hedw. Synœcious: plants pale green, soft; stems creeping, with long decumbent flat irregularly pinnate divisions: stem-leaves loosely imbricate, auriculate and unsymmetrical at base, broadly lingulate, rounded at the apex and slightly concave; borders erect, entire or slightly crenulate; costa slender, often forking; cells of the areolation round, the basilar narrow, linear, pale; outer perichætial leaves small, reflexed, squarrulose, the upper sheathing, ovate, abruptly acuminate: calyptra smooth: capsule subemergent, urceolate or oblong-cylindrical, pale brown and glossy when old; lid conical-subulate, oblique; teeth narrowly lanceolate, subulate, rugulose, pale; segments as long, not carinate. — Musc. Frond. iii. 58, t. 22; Muell. Syn. ii. 46. *Pilotrichum distichum*, Beauv. Prodr. 83. *Daltonia disticha*, Arnott, Disp. 54.

Hab. On trees, Indian River, Florida (*J. Donnell Smith, Austin*).

2. **N. undulata,** Hedw. Synœcious: secondary stems slender, decumbent, mostly simple, yellowish green: leaves distichous, compressed, divaricate, clasping the stem on one side, oblong, lingulate, very obtuse or truncate at the apex, not concave, transversely undulate, serrulate on the borders; costa narrow, ascending; cells elongated at base, oblong in the middle, rounded at the apex; outer perichætial leaves ovate, abruptly acuminate, reflexed, the upper narrowly long linear-subulate, surpassing the orifice of the capsule, ecostate or narrowly short-costate, subserrulate: calyptra small, covering the lid only, generally split on one side, covered with few hairs: capsule sessile, small, cylindrical-oblong; lid conical, short-

beaked; teeth and segments nodulose, punctulate, free to the base. — Musc. Frond. iii. 51, t. 21. *Pilotrichum undulatum*, Beauv.; Muell. Syn. ii. 147.

HAB. On trees, Florida (*D. B. Smith, J. Donnell Smith, Austin*).

3. **N. Menziesii,** Drumm. Dicœcious: plants large and loosely cespitose, yellowish green, dark yellow when old; primary stems creeping, slender, naked; the secondary 15 to 20 c.m. long, flat, pinnately divided; branches open, flat, short, attenuated, often flagelliform at the apex, sometimes covered with long lateral filiform flagellæ: stem-leaves undulate above the middle, not auriculate at base, oblong, lingulate, obtuse at the slightly apiculate apex and minutely denticulate, concave, revolute at base on one side; costa slender, vanishing above the middle; perichætial leaves enlarged in the middle, tapering upward into a long denticulate acumen: fertile flowers on the secondary stems, pedunculate, exserted, the male very numerous along the primary stems or at the base of the branches: capsule immersed, oblong-oval, pale brown, red at the orifice; lid conical, short-beaked, acute and inclined; teeth narrowly lanceolate, distinctly nodose-articulate, with a pellucid border; segments solid, as long as the teeth, split between the articulations; cilia none. — Musc. Amer. n. 162; Lesq. Proc. Calif. Acad. i. 28, describing flowers and fruit Sulliv. Icon. Musc. Suppl. 83, t. 62.

HAB. Rocky Mountains (*Drummond*), sterile; roots of trees, California (*Bolander*), fertile; Oregon (*E. Hall*); Fort Colville (*Lyall*); Spokan Falls, etc. (*Watson*).

4. **N. pennata,** Hedw. Monœcious: the secondary stems pinnately branching or nearly simple, erect: leaves ovate or oblong, lanceolate, short-acuminate, slightly unequal at base, entire or slightly serrulate from the middle upward; costa marked at base with a short bipartite yellowish line, transversely 3–5-wrinkled; areolation linear, very small; inner perichætial leaves half-sheathing, long-lanceolate, surpassing the capsule by the acuminate apex, entire; vaginule hairy: calyptra small, whitish, covering only the operculum, which is conical-acute or short-beaked, inclined: capsule oval-oblong, dirty yellow, becoming brown by age, thin-walled; teeth linear-subulate from a narrowly lanceolate base, cohering at the apex, densely articulate, irregularly divided, pale yellow; segments rudimentary. — Musc. Frond. iii. 47, t. 19; Bryol. Eur. t. 440.

HAB. Trunks of trees; very common in mountainous districts.

5. **N. oligocarpa,** Bruch & Schimp. Monœcious: resembling the last; stems slender, pinnately branching, the branches attenuate to the apex: leaves compressed, the anterior and posterior distinctly curved obliquely outward, lingulate, abruptly acuminate, deeply undulate, serrate at the apex; cells short, minute: male flowers very numerous; perichætium with few leaves, the inner narrow and sheathing: calyptra large: capsule small, ferruginous; lid orange, conical-acute or short-beaked; teeth linear-lanceolate, closely articulate; segments rudimentary. — Bryol. Eur. t. 441. *N. pennata*, var. *tenera*, Muell. Syn. ii. 50.

Hab. White Mountains, Erroll Dam, in Crawford Notch (*James*), fertile; on trees, New Mexico (*Fendler*), sterile.

6. **N. Douglasii,** Hook. Diœcious: loosely cespitose; secondary stems 10 to 20 c.m. long, yellowish green, compressed, pinnately divided; branches long, simple, flexuous, attenuate at the apex: stem-leaves close, oblong or lanceolate-acuminate, sharply dentate, spinulose or serrulate at the apex, denticulate at base, entire in the middle; costa obsolete or none; perichætial leaves ovate-lanceolate, acute, denticulate at the apex, the inner sheathing: capsule half-exserted, narrowly ovate; teeth yellow, densely articulate; segments as long and similar, split open between the articulations. — Bot. Misc. i. 131, t. 35; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. ed. 2, n. 394.

Hab. Northwestern coast (*Menzies, Douglas, Scouler*); shaded rocks, California (*Bolander*).

7. **N. complanata,** Hueben. Diœcious: soft, pale green; secondary stems slender, curving down or pendent, divided into short branchlets narrowed to the apex or flagellate from the apex and from the sides: leaves compressed, plane, smooth, oblong-lingulate, abruptly apiculate, subserrulate at the apex; upper areolation rhomboidal, the basilar linear; perichætium subsessile, long-sheathing; vaginule hairy: calyptra naked or with a few hairs: capsule oval, on a slender pedicel 3 or 4 times as long as the perichætium; lid narrowly oblique, rostrate; teeth long, narrow; segments filiform from an enlarged base, half as long as the teeth. — Musc. Germ. 576; Bryol. Eur. t. 444. *Hypnum complanatum*, Linn. Spec. Pl. 1123. *Leskea complanata*, Hedw. Spec. Musc. 231.

Hab. On rocks; New Brunswick, New England, Alleghany Mountains in Pennsylvania, etc.

* * *Capsule exserted.*

8. **N. pumila,** Hedw. Dicœcious: tufts soft, dark green; secondary stems pinnately ramulose; branches short or long-flagellate: leaves ovate-oblong, abruptly acuminate or apiculate, undulate-serrulate at the apex, inflexed on one side at base, revolute on the other; areolation minute; inner perichætial leaves long-sheathing: calyptra descending to below the orifice of the narrowly ovate capsule: pedicel longer than the perichætium; operculum conical, obliquely short-beaked; teeth linear-lanceolate, densely articulate; segments abruptly narrowed, filiform from a broad carinate plicate base, shorter than the teeth. — Musc. Frond. iii. 49, t. 20; Bryol. Eur. t. 442.

HAB. Trunks of trees. Credited to North America by Bruch & Schimper, as collected by *Drummond.* We have seen no American specimens.

* * * *Species known from sterile plants only.*

9. **N. (Pilotrichum?) Floridana,** Aust. Primary stem creeping, with small ovate-lanceolate acuminate ecostate flat-bordered leaves; secondary stems somewhat compressed, erect or pendent, strict or curved, simple or sparingly branching above, obtuse: leaves erect, open, imbricate, narrowly oblong-lanceolate, deeply canaliculate or cymbiform, gradually acute, plicate-striate above the middle, obsoletely papillose, broadly revolute on the borders, entire or obsoletely serrulate, costate to above the middle; cells minute, linear, fusiform, the basilar broader, quadrate, granulose at the angles. — Coult. Bot. Gaz. iv. 152.

HAB. On trees, Caloosa, Florida (*J. Donnell Smith, Austin*).

10. **N. (Orthostichella) Ludoviciæ,** Muell. Plants slender, sparingly pinnately divided into short branches in the middle, simple and turgid at the apex: stem-leaves erect, open, rounded at base, linear-cymbiform, long-acuminate, slightly denticulate at the apex; alar cells minute, fawn-color; borders erect; costa very thin, percurrent. — Regensb. Flora (1875), lviii. 92.

HAB. Decayed trunks; Louisiana, near Baton Rouge (*Dr. Joor*, 1874), sterile.

11. **N. cymbifolia,** Muell., l. c. Growth and aspect of the preceding: leaves closely imbricate, spirally five-ranked, oblong-lanceolate, concave-cymbiform, gradually acuminate, plane at

the apex; cells of the upper areolation minute, linear-oblong or vermicular, those of the basal angles quadrate, opaque; costa vanishing below the apex; perichætial leaves much smaller, lanceolate, narrowly long-acuminate, not costate: flowers diœcious; the female only are known. — *Pilotrichum cymbifolium*, Sulliv. Mosses of U. States, 81, and Icon. Musc. 122, t. 76, B.

Hab. On trees, in a hummock, E. Florida (*Binney*, 1846); Enterprise, Florida (*J. Donnell Smith, Austin*).

106. HOMALIA, Brid. (Pl. 5.)

Plants repeatedly distichous, stoloniferous. Leaves imbricate, diverging laterally, flattened, cultriform, smooth, glossy, minutely areolate; the upper rhomboidal, the lower oblong-hexagonal. Flowers monœcious. Calyptra cucullate, naked. Capsule long-pedicellate, erect or cernuous. Operculum obliquely rostrate from a highly convex base. Peristome double; teeth long, densely articulate, confluent at base, yellowish; basilar membrane broad; segments narrow, sublinear, as long as the teeth, carinate and perforated along the keel; cilia none or solitary and very short. Annulus distinct. — *Omalia*, Bruch & Schimp.

1. **H. trichomanoides**, Bruch & Schimp. Loosely tufted, pale green; stems slender, interruptedly foliate by the numerous innovations: leaves vertically flattened or curved downward, oblong, cultriform, subfalcate, obtusely apiculate, minutely serrulate on the borders; costa slender, vanishing above the middle: capsule erect or slightly curved, pale brown. — Bryol. Eur. t. 446. *Hypnum trichomanoides*, Schreb. Spicil. Fl. Lips. 88. *Leskea trichomanoides*, Hedw. Spec. Musc. 231.

Hab. On rocks near Lake Superior (*Drummond*).

2. **H. obtusata**, Mitt. Differing from the last in the leaves more obovate and more rounded at the apex, the costa sometimes imperceptible, and the cells in the apex shorter. — Journ. Linn. Soc. viii. 38. *Neckera obtusata*, Mitten, l. c. iii., Suppl. 118.

Hab. Mitten refers to this Thibetian species a few imperfect specimens found in British Columbia by Lyall.

3. **H. Jamesii**, Schimp. Much like *H. trichomanoides*, differing in its smaller size, the leaves longer, more solid, sub-

falcate-lingulate and striolate lengthwise when dry, and the beak of the operculum and the peristome shorter. — Syn. 473.

HAB. Catskill and White Mountains, on overhanging rocks (*James*); Pennsylvania (*Rau*).

4. **H. gracilis**, James. Plants soft, slender, much divided, divaricate; branches gradually filiform and flagelliform, flexuous: lower leaves loosely imbricate, slightly oblique, open, lingulate, oblong, obtuse and obtusely apiculate, those of the upper branches more distant, erect, all with double basilar costa or none, and entire; perigonial leaves few, ovate-acuminate, slightly margined by a row of longer cells: antheridia few (2 to 4), sparingly paraphysate: female flowers and fruit unknown. — Rep. Reg. New York Univer. (1869), xxii. 57; Sulliv. Icon. Musc. Suppl. 82, t. 25.

HAB. On rocks, Sand Lake, New York (*V. Colvin*); Adirondack Mountains (*C. H. Peck*); Catskill Mountains (*James*); New Jersey (*Austin*), with male plants.

107. METEORIUM, Brid.

Plants long, pendent from the branches of trees; stems foliate from the base, distantly pinnate; branches filiform, attenuated. Leaves imbricate-cordate, clasping; cells of the areolation long, narrow, linear, at the base oval-quadrate and inflated. Capsule generally short-pedicelled. Peristome as in *Homalia*.

1. **M. pendulum**, Sulliv. Plants yellowish green; branches long and very slender, flexuous: leaves open-erect, those at the base of the branches larger and flattened, linear-lanceolate, gradually narrowed to a long filiform point, opaque, papillose on the back, serrulate on the slightly recurved margin, costate to the middle; alar cells larger, angular-ovate, the upper linear-fusiform; perichætial leaves small, scarcely covering the hairy vaginule, loosely areolate: flowers diœcious (?), the male unknown: calyptra long-conical: capsule small, oval, on a pedicel double its length; lid conical, obliquely short-beaked; peristome double; teeth lanceolate, distantly articulate, more or less perforated and split along the dividing line; segments from a broad basilar membrane, slightly shorter than the teeth, linear-lanceolate, carinate; cilia none. — Mosses of U. States, 81, and Icon. Musc. 117, t. 73.

HAB. On trees and bushes, Western Louisiana (*Teinturier, Riddell*).

2. **M. nigrescens,** Mitt. Branches creeping; branchlets long, flexuous, pinnately branching: leaves open-spreading, undulate lengthwise, cordate at base, lanceolate, narrowly acuminate, costate to above the middle; borders flat, more or less undulate, minutely crenulate; perichætial leaves similar, thinner: calyptra split on one side, covered with a few hairs: capsule short-pedicellate, broadly oval, exserted above the hairs of the vaginule; operculum subulate. — Journ. Linn. Soc. xii. 441. *Hypnum nigrescens*, Swartz, Prodr. 141. *Neckera nigrescens*, Schwaegr. Suppl. iii., t. 244. *Trachypus*, Mitt. l. c. viii. 45.

Hab. Florida (*Garber, J. Donnell Smith, Austin, Russell*); Lake Huron, in fruit (*Todd*); Canada West (*Emery*). The distribution of this tropical species so far north as Canada is remarkable.

Tribe XVIII. LEUCODONTEÆ.

Primary stems creeping, the secondary erect or pendent, simple or branching, irregularly or subpinnately ramulose. Leaves close, open or secund, ovate, obovate or oblong-lanceolate, subscarious, solid, generally plicate lengthwise, glossy; costa simple or double, rarely none; upper areolation rhomboidal or linear, the lower in rows, vermicular-linear, punctiform at the basilar angles. Flowers dicœcious; perichætium long, sheathing. Calyptra large, dimidiate, cucullate, its base sometimes confluent under the capsule. Capsule more or less long-pedicellate, erect or oblique by the curve of the pedicel, symmetrical. Peristome simple or double, more or less perfect.

108. LEUCODON, Schwaegr. (Pl. 4.)

Secondary stems erect or arcuate, simple, generally stoloniferous, densely foliate. Leaves decurrent, ecostate, sulcate lengthwise; cells of the areolation narrowly linear-vermicular, the middle and basilar punctiform. Calyptra solid, cucullate, often attached below the capsule by the connate base. Capsule coriaceous, oval-oblong, microstome, exserted or emersed on a short straight pedicel. Operculum conical or obliquely short-rostrate. Peristome simple; teeth thin, distantly articulate, 2–3-cleft at the apex, papillose, whitish.

1. **L. sciuroides,** Schwaegr. Tufts rigid, dark and olive-green: leaves densely crowded, imbricate when dry, open when moistened, ovate-lanceolate, sharply acuminate, 5-plicate lengthwise; perichætial leaves pale, not plicate: calyptra yellowish brown at the apex: capsule elliptical or ovate-oblong, fuscous, exserted on a thick pedicel, twisted to the right when dry; operculum conical, uniform in color; teeth slender, whitish, distantly articulate, entire or split toward the base; annulus simple, detached by fragments. — Suppl. i. 2. 1, t. 125, figs. *x* and *y*; Bryol. Eur. t. 468. *Hypnum sciuroides*, Linn. Spec. Pl. 1130. *Neckera sciuroides*, Muell. Syn. ii. 107.

HAB. On trees, Owen Sound, Ontario, Canada (*Mrs. Roy*).

2. **L. julaceus,** Sulliv. Secondary stems short, numerous, terete: leaves crowded, densely imbricate when dry, spreading horizontally when moist, lanceolate-acuminate from an ovate-elliptical base, recurved on the borders, slightly serrulate at the apex; inner perichætial leaves exserted, oblong, narrowed into a filiform acumen reaching nearly to the base of the capsule, convolute: calyptra large, plicate at base, clasping the top of the pedicel: capsule oval, turgid, chestnut-color; operculum conical, obliquely short-rostrate; teeth of the peristome broad, linear, whitish, punctulate, bifid at the apex; inner membrane very thin, narrow; annulus none. — Musc. Allegh. n. 87, and Icon. Musc. 110, t. 69. *Pterigynandrum julaceum*, Hedw. Musc. Frond. iv. 51, t. 20. *Neckera pseudalopecura*, Muell. l. c. 92.

HAB. On trees, Northeastern slope of America; very common.

3. **L. brachypus,** Brid. Differs from the last in its larger size, the leaves inclined to one side, plicate-striate, the perichætial loosely appressed, the upper surpassing the more oblong capsule. — Bryol. Univ. ii. 210; Sulliv. Icon. Musc. 111, t. 70. *Neckera brachypus*, Muell. l. c. 108.

HAB. Common in mountainous districts; more rarely fruiting.

109. PTERIGYNANDRUM, Hedw.

Stems prostrate or appressed; branches and branchlets flagelliform; basilar stolons numerous, with small leaves. Leaves densely crowded, spreading or subsecund, subscarious, papillose on the back, obovate or spatulate, apiculate, costate to the middle; areolation dense, rhomboidal above, rectangular in

the middle; paraphyllia small, polymorphous. Flowers diœcious. Calyptra cucullate, large, covering the capsule to below the middle. Capsule erect, cylindrical-oblong. Operculum rostrate. Peristome small; teeth short, linear-lanceolate, strongly and distantly articulate; segments very short, imperfect; cilia none. Annulus very narrow.

1. **P. filiforme,** Hedw. Plants widely cespitose, appressed, bright or yellowish green; branches and branchlets prostrate all in one direction, filiform and flagelliform: leaves concave, appressed and imbricate when dry, narrowly reflexed on the borders, serrate at the apex; costa simple, ascending to the middle, or shorter and bipartite; cells of the basilar angles few, not chlorophyllose; perichætial leaves pale, thin, the inner oblong, short-acuminate, minutely serrate at the apex, costate at base. — Musc. Frond. iv. 18, t. 7; Bryol. Eur. t. 466; Sulliv. Mosses of U. States, 105. *Neckera filiformis*, Muell. Syn. ii. 89.

Var. **cristatum.** Leaves cristate-serrate at the apex; costa stronger, ascending higher. — *Leptohymenium cristatum*, Hampe, Linnæa, xxx. 459.

Var. **minus.** Leaves obscurely papillose, scarcely dentate at the apex; costa short, basilar, scarcely distinct; segments as long as the teeth.

Hab. Roots of trees or shaded rocks; Northern States and Canada; var. *cristatum* in California (*Bolander, Bauer*); the last in the Adirondack Mountains, on rocks (*Lesquereux*).

The description refers to the very common European form, which is, however, rare in America, but is replaced by a number of varieties not distinct enough to authorize specific separation.

110. PTEROGONIUM, Swartz. (Pl. 6.)

Primary stems very slender, with few distant pale leaves, the secondary robust, in dense wide divisions; branches and branchlets curved to one side. Leaves crowded, spreading when moist, imbricate when dry, broadly ovate or obovate-acuminate, serrulate, scarious, glossy; costa flat, bipartite, vanishing below the middle; cells of nearly the whole base obliquely oval, those of the middle and top linear-fusiform, all very small and smooth. Flowers diœcious. Calyptra cucullate, with a few

hairs. Capsule regular or slightly curved. Peristome double; teeth long, densely articulate; segments scarcely half as long.

1. **P. gracile,** Swartz. Tufts loose, yellowish green; secondary stems simple at base: capsule cylindrical-oblong, chestnut-color, with a narrow orifice; peristome pale, fragile; segments short, narrowly linear; annulus compound. — Musc. Suec. 26; Bryol. Eur. t. 467; Sulliv. & Lesq. Musc. Bor.-Amer. ed. 2, n. 349. *Hypnum gracile*, Linn. Mant. ii. 310. *Pterigynandrum gracile*, Hedw. Musc. Frond. iv. 16, t. 6. *Neckera gracilis*, Muell. Syn. ii. 97.

Var. **duplicato-serratum,** Lesq. Plants more slender, filiform: leaves duplicate-serrate. — Mem. Calif. Acad. i. 30. *Leptohymenium duplicato-serratum*, Hampe., Linnæa, xxx. 460.

Hab. On rocks, California (*Bolander, Bauer, Watson*); common and variable.

From the numerous specimens examined it is evident that the moss described by Hampe represents a mere variety. The California specimens, though identical in their essential characters with the European form, differ sometimes in the more marked denticulations of the leaves, and in the annulus, which appears a little longer and is sometimes composed of three cells instead of two. These unimportant differences are merely casual, and not observable upon all the specimens.

2. **P. brachypterum,** Mitten. Monœcious: stems procumbent, irregularly pinnately divided into short branches: leaves closely imbricated, broadly deltoid-ovate, narrowly acuminate, concave; borders flat in the lower part, minutely serrulate above; costa vanishing above the middle; cells of the basal angles small, round, the others oval, longer at the apex, all distinctly papillose; perichætial leaves erect, ovate-acuminate, very entire, nerved to above the middle: capsule cylindrical-oval, erect, equal; pedicel long, thickish, yellow; operculum short-conical; teeth short, yellow, attached under the orifice, connate at base; cilia none: male flowers gemmiform, large. — Journ. Linn. Soc. viii. 37.

Hab. British America (*Drummond*).

The author remarks that this plant closely corresponds in structure and appearance to the Abyssinian *P. abbreviatum*, Schimp., and is quite distinct from any other American moss.

111. ANTITRICHIA, Brid. (Pl. 4.)

Secondary stems of various lengths, sometimes very long, procumbent or pendent, simple or much divided, more or less

pinnately ramulose, rarely flagelliform. Inflorescence and areolation as in the preceding genus. Calyptra shorter than the capsule, smooth. Peristome double. Teeth narrowly lanceolate-subulate, thin, pale, smooth on both sides; segments a little shorter, narrow, subulate, obscurely carinate, fugacious; basilar membrane none.

1. **A. curtipendula,** Brid. Leaves densely crowded, open and subsecund, decurrent at base, plicate in the lower part, broadly ovate-lanceolate, acuminate, denticulate at the apex, reflexed on the borders; costa flat, thin, sometimes enlarged and divided at base, vanishing below the apex: cells of the areolation very small, fusiform in the middle, transversely oval toward the base from near the costa to the borders; perichætium long, polyphyllous, sheathing, the inner leaves long, abruptly narrowed into a long acumen, ecostate: capsule oval, on a curved or flexuous pedicel slightly longer than the perichætium; operculum conical, short-rostrate; annulus simple, very narrow. — Musc. Recent. Suppl. iv. 136; Bryol. Eur. t. 469. *Hypnum curtipendulum*, Linn. Spec. Pl. 1128. *Neckera curtipendula*, Muell. Syn. ii. 116.

Var. **gigantea,** Sulliv. & Lesq. Plants stronger: leaves not plicate, broadly reflexed on the borders; cells shorter, more obtuse; costa broader, more divided: capsule ovate-cylindrical, on a thick erect pedicel. — Musc. Bor.-Am. Exsicc. (ed. 2), n. 356.

Hab. Summit of Black Mountains, North Carolina (*Lesquereux*); Lake Superior (*Agassiz*); Oregon and Vancouver Island (*Pickering, Wood*); the variety in the woods, in mountain districts of California (*Bolander*).

2. **A. Californica,** Sulliv. Differs from the last in the short julaceous branches, the leaves appressed when dry, short-acuminate, scarcely denticulate toward the apex, cells oval, capsule cylindrical, twice as long, reddish, on a straight pedicel, teeth longer and punctulate, cilia short, not half so long as the teeth, and the spores half as large. — Lesq. Trans. Amer. Phil. Soc. xiii. 11; Sulliv. & Lesq. l. c. n. 357; Sulliv. Icon. Musc. Suppl. 79, t. 59. *A. curtipendula*, Sulliv. Pacif. R. Rep. iv. 189.

Hab. On trees in woods, California (*Bolander, Watson*); Spokan Falls (*Watson*).

Tribe XIX. HOOKERIEÆ.

Plants small, soft, sparingly and irregularly branching. Leaves either narrow and spreading or broader, ovate, nearly round, or lingulate, flat, loosely imbricate; areolation large; perichætium of few leaves, on a short rooting perichætial branch. Calyptra conical or mitrate, nearly entire at base or ciliate, smooth or papillose or pilose. Capsule sub-erect or cernuous or horizontal, on a long papillose rarely scabrous pedicel. Peristome double, large, regular; teeth lanceolate, subulate, densely articulate; segments carinate.

112. HOOKERIA, Tayl.

Leaves ovate or lingulate, abruptly or gradually acuminate, rarely round or truncate, bicostate, generally margined and serrate, opaque. Flowers monœcious. Calyptra narrowed at base, scarcely reaching lower than the operculum. Teeth of the peristome linear-lanceolate, subulate, purplish; segments entire, orange-color. Annulus simple, narrow.

1. **H. varians**, Sulliv. Polygamous: plants densely cespitose, yellowish; stems and branches flattened: leaves ovate, acuminate and lanceolate, soft, hyaline, with a large round or oblong areolation, margined by a single row of elongated cells, scarcely serrulate, bicostate to the middle: calyptra glabrous: capsule oblong, horizontal; lid conical, subulate; peristome normal. — Proc. Amer. Acad. v. 285.

Hab. Enterprise, Florida (*J. Donnell Smith, C. H. Fitzgerald*).

2. **H. cruceana**, Duby. Plants very small, yellowish green, irregularly divided; branches slender, short, complanate, rounded at the apex: stem-leaves loose, secund, crispate when dry, erect-open when moist, broadly ovate or lingulate, often reflexed at the mucronate apex, concave, papillose; upper areolation with serrate papillæ, the upper cells irregularly globose-angular, the lower larger and longer; costa double, enlarged and diverging at base, converging nearly to the apex of the leaves; perichætial leaves smaller, similar: calyptra glabrous, conical, at first covering the whole capsule, later covering it to the middle, fimbriate, caducous: capsule first erect, then hori-

zontal, brown, very small, oblong or ovate-cylindrical, short-necked; operculum half as long as the capsule; teeth incurved, broad, lamellate, cristate on the borders, dark purple; segments longer, narrow, plane, subhyaline. — Crypt. Exot. in Genèv. Soc. Phys. Mém. xix. 302, t. 4, f. 2; Mitten, Journ. Linn. Soc. xii. 349.

HAB. Florida (*Austin, J. Donnell Smith, Fitzgerald*); sterile.

3. **H. (?) Sullivantii,** Muell. Ms. Stems short, prostrate, sparingly branched: leaves ovate-oblong, acute, hyaline, entire, soft, yellowish, of the same consistence, color and size as those of *Pterigophyllum lucens:* fruits and flowers unknown. — *H. acutifolia*, Sulliv. Mosses of U. States, 66.

HAB. Cold mountain springs; Middle Ohio and Alleghany Mountains (*Sullivant*); North Carolina (*Lesquereux*); deep cañons, California (*Bolander*); very rare and found only sterile.

The position of this species is still uncertain.

HOOKERIA ANOMALA, Muell. (*Rhacophilum*, Schwaegr.; *Pterygophyllum*, Mitt.), a species with erect tomentose stems and sparse leaves, broadly obtuse from a shortly spatulate base, oblique, unequal, coarsely and distantly serrate, the cells thick, large, round-hexagonal, obtuse near the border, and separated by intercellular ducts, is, according to Mitten (Journ. Linn. Soc. xii. 397), a Fuegian species, though stated by Schwaegrichen, probably through mistake, to have been collected originally in Northwestern America by Menzies.

113. PTERYGOPHYLLUM, Brid. (Pl. 5, as *Hookeria.*)

Plants pale green, glossy, plano-foliate; branches few, rooting at base like the primary stems and similar to them. Leaves large, densely and obliquely imbricate, smooth, chlorophyllose, broadly ovate, obtuse or acuminate, ecostate, entire; cells of the areolation large, round in the upper part, hexagonal at base. Flowers monœcious; perichætium small, on a short thick rooting perichætial branchlet, serving as vaginule; perichætial leaves few, lanceolate, thin. Calyptra mitrate. Peristome that of *Hookeria.*

1. **P. lucens,** Brid. Lower leaves rounded, the upper larger, broadly ovate-oblong, flat and obtuse: capsule small, oval, chestnut-color, turning to black; pedicel long, thick, reddish; lid long-beaked from a conical base; segments slightly dehiscent along the keel. — Musc. Recent. Suppl. iv. 149;

Bryol. Eur. t. 448. *Hookeria lucens*, Smith, Engl. Bot. t. 1902, and Trans. Linn. Soc. ix. 275.

Hab. Decayed logs in dark shaded ravines; Oregon (*E. Hall*).

Tribe XX. FABRONIEÆ.

Plants very small, creeping, in glossy green or small yellowish tufts; branches erect. Leaves crowded, spreading, ovate-lanceolate, dentate or ciliate, rarely entire, soft; areolation loose, rhomboidal, chlorophyllose; costa short or none. Calyptra cucullate, dimidiate. Capsule ovate, erect, symmetrical, distinctly necked, short-pedicelled. Operculum somewhat large, obtuse or rostrate. Peristome simple, of 8 bigeminate or of 16 solid remotely articulate teeth; absent in one species.

114. FABRONIA, Raddi. (Pl. 4.)

Leaves very thin and delicate; costa none or simple, obsolete. Flowers monœcious. Capsule thin.

1. **F. pusilla**, Raddi. Cespitulose; plants yellowish green: leaves close and subsecund, or more distant and spreading, ovate-lanceolate, prolonged into a long filiform acumen, laciniate-dentate on the borders to below the middle, the laciniæ sometimes long, with a few teeth; costa none or very short: capsule subspherical, minute, truncate when empty; lid large, broadly convex-conical; teeth 16, approximate in pairs, sometimes bifid at the apex or splitting along the dividing line, yellow. — Att. Accad. Siena, ix. 230; Schwaegr. Suppl. i. 2. 337, t. 99; Bryol. Eur. t. 450.

Var. **ciliata.** Cilia of the leaves longer. — *F. Schimperiana*, DeNot. Briol. Ital. 228; Lindb. Journ. Linn. Soc. xiii. 71.

Hab. Bark of trees, Santa Fe, New Mexico (*Fendler*); Oakland, California (*Bolander*).

2. **F. gymnostoma**, Sulliv. & Lesq. Much like the preceding, differing in its shorter ciliate leaves, with a distinct costa gradually diminishing to near the middle, and especially in the absence of a peristome, the orifice of the capsule being closed by a horizontal membrane. — Musc. Bor.-Amer. Exsicc. n. 254; Sulliv. Icon. Musc. 136, t. 86.

Hab. Santa Fe, New Mexico (*Fendler*).

3. **F. octoblepharis,** Schwaegr. More robust, though very small: leaves green, spreading in all directions or 2-ranked, coarsely dentate on the borders, costate to below the middle: capsule oval, with a more distinct neck and a longer pedicel; peristome of 8 geminate dark brown teeth, recurved when dry, bifid only when old. — Suppl. i. 2. 338, t. 99, figs. *a*, *b*; Bryol. Eur. t. 451.

HAB. Athens, Illinois (*E. Hall*).

4. **F. Wrightii,** Sulliv. Plants very small, delicate, loosely cespitose, bright green; stems fragile, stoloniferous: leaves open, long-lanceolate, gradually subulate-acuminate, concave, costate to the middle; borders serrate or subciliate-dentate; cells narrow, fusiform, the basilar and alar quadrate; inner perichætial leaves oblong, short-acuminate, ecostate: capsule pyriform, including its neck; teeth 16, approximate in pairs, long-deltoid, orange-colored; operculum conical, blunt at the apex. — Mosses of U. States, 61, and Icon. Musc. 133, t. 84; Sulliv. & Lesq. l. c., n. 251.

HAB. San Marcos, Texas (*Wright*).

Differs from the last in its conical (not mamillate) operculum, its orange-yellow teeth, and the less numerous quadrate basal cells.

5. **F. Ravenellii,** Sulliv. Very much like the last, differing in the nearly entire or obscurely serrate leaves, the brown teeth, and the larger spores. — Mosses of U. States, 61, t. 4, and Icon. Musc. 135, t. 85; Sulliv. & Lesq. l. c. n. 252. *F. Caroliniana*, Sulliv. & Lesq. l. c., n. 253; Sulliv. Mosses of U. States, 62.

HAB. Decayed logs; Santee Canal, South Carolina (*Ravenel*).

6. **F. Donnellii,** Aust. Leaves oblong-lanceolate, sometimes submarginate, obscurely serrate; costa obsolete; meshes of the areolation narrow, the basilar larger, subquadrate, inflated: capsule oval, slightly curved; teeth 16, large, incurved and nearly horizontal when dry, erect when moistened, sublanceolate, the dorsal articulations very prominent. — Coult. Bot. Gaz. ii. 111.

HAB. On the branches of a Live Oak, Florida (*J. Donnell Smith*).

Mode of growth and form of capsule much as in *Hypnum microcarpum*, but smaller in all its parts, with narrower and more narrowly reticulated leaves, the inflated cells at the basal angles more numerous, peristome different, etc. Remarkable for the prominent articulations of the peristomal teeth. — (*Austin.*) We have seen no specimens. The description agrees with the characters of *Hypnum microcarpum*, Muell., in the

articulate teeth of the peristome, and not with *Fabronia*. As the operculum is unknown the true position of the moss is uncertain. The peristome is that of *Habrodon*.

115. ANACAMPTODON, Brid. (Pl. 4.)

Plants soft, somewhat more robust than in *Fabronia*, widely cespitulose, dark green. Leaves ovate-lanceolate, very entire, plano-concave, chlorophyllose; costa slender, vanishing above the middle; areolation rhomboidal-oval. Flowers monœcious; perichætium of few leaves, covering the slightly hairy vaginule. Calyptra descending to below the lid, whitish. Capsule oval-oblong, with a thick neck, constricted under the orifice when dry, solid. Operculum short-rostrate, from a convex-conical base, straight or oblique. Peristome double; outer teeth 16, lanceolate, close in pairs, distinctly articulate, marked by a straight dividing line, pale, reflexed when dry; segments 16, filiform, shorter than the teeth. Annulus none. Spores small, yellowish green.

1. **A. splachnoides**, Brid. The only known species.—Musc. Recent. Suppl. iv. 136; Bryol. Eur. t. 453. *Neckera splachnoides*, Schwaegr. Suppl. i. 2. 151, t. 82. *Campylodontium hypnoides*, Schwaegr. Suppl. iii., t. 211. *Fabronia splachnoides*, Muell. Syn. ii. 38.

Hab. Forks and hollow knots or decaying horizontal surfaces of fallen trees; rare.

116. HABRODON, Schimp.

Plants small; habit and mode of growth of *Fabronia*. Leaves squarrose when moist, loosely incumbent when dry, ovate-lanceolate, long-acuminate, entire; perichætial leaves open-erect or spreading, the outer ovate-lanceolate, the inner long-lanceolate, hyaline, erose-dentate on the borders. Flowers diœcious; vaginule smooth, on a short rooting branchlet. Capsule oval-oblong, thin. Lid conical, obtuse. Peristome simple, attached far below the orifice of the capsule; teeth linear-lanceolate, spreading from the middle when moist, strongly and distantly articulate. Annulus compound, narrow.

1. **H. Notarisii,** Schimp. Tufts bright green; stems creeping; branches short, erect-spreading: leaves ecostate; cells of the areolation elliptical, fusiform in the narrower part and in the middle of the leaves, quadrate and transversely rectangular along and toward the borders: capsule light brown, minutely sulcate, with a small orifice and no collum; pedicel 8 to 10 m.m. long, twisted to the left when dry. — Syn. 505, and Bryol. Eur. Suppl. *Habrodon*, 2, t. i. *Pterogonium perpusillum*, DeNot. *Clasmatodon perpusillus*, Lindb. Journ. Linn. Soc. xiii. 70.

HAB. Trunks of trees, Central Ohio (*Sullivant*); sterile.

117. CLASMATODON, Hook. & Wils. (Pl. 5.)

Plants minute; stems very slender, filiform, creeping, intricate and irregularly branching. Leaves imbricate, erect or spreading, concave, lanceolate-acuminate from a broadly ovate base; borders entire or minutely serrulate at the apex, recurved toward the base; costa flat, vanishing in the middle; areolation fusiform, quadrate near the borders from the middle to the base; perichætial leaves long-lanceolate, ecostate, loosely areolate, the inner half-sheathing. Flowers monœcious. Calyptra dimidiate. Capsule very small, short-pedicelled, oblong-oval, erect, thin, constricted under the orifice when dry. Operculum conical, obliquely long-rostrate. Peristome simple, of 16 yellowish very irregular teeth, distantly and obscurely articulate, dentate or perforated at base, granulate and geniculate. Annulus large, compound, of 3 or 4 cells, persistent, covering the basilar membrane, dark colored.

A single species is known of this genus. Lindberg, however, refers to it both *Habrodon* and *Anisodon* of Schimper.

1. **C. parvulus,** Sulliv. Characters of the genus, as above. — Mosses of U. States, 60, and Icon. Musc. 126, t. 79; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 246; Lindb. Journ. Linn. Soc. xiii. 70. *Leskea parvula*, Hampe. *C. pusillus*, Hook. & Wils. in Drumm. Musc. Amer. (Coll. II.), n. 80; Wilson, Hook. Journ. Bot. (1842) iv. 421, t. 25, A. *Anisodon acutirostris*, Schimp. in Bryol. Eur. *Anisodon*, 4.

Var. **rupestris**, Sulliv. & Lesq. More densely tufted, stouter; branches julaceous: leaves shorter, broader, obtuse: capsule broader; operculum shorter. — Musc. Exsicc. n. 246[b].

Hab. Trunks and branches of trees, especially along rivers; the variety on rocks covered by inundations, and on the muddy base of trees, in the Southern States.

The variety appears to resemble closely, if indeed it is not identical with, *Anisodon acutirostris* of Schimper, of which we have seen no authentic specimens. — (*Sullivant.*)

Tribe XXI. LESKEEÆ.

Primary stems creeping; stems or primary branches diversely branching, erect or declining or prostrate. Leaves equally spreading or secund, soft, opaque, costate, with paraphyllia of various forms often interposed; cells of the areolation densely chlorophyllose, papillose, minute, hexagonal or punctiform in the upper part, looser and hexagonal-rectangular below. Flowers upon the primary or secondary stems; vaginule perfect. Calyptra cucullate, naked. Capsule symmetrical, erect or curved, oblique or horizontal. Peristome double; the teeth linear-lanceolate or subulate; inner basilar membrane more or less deeply cut into 16 carinate-plicate segments shorter than the teeth, sometimes separated by rudimentary or long perfect cilia. Spores minute.

118. THELIA, Sulliv. (Pl. 6.)

Plants growing in compact glaucous or yellowish green mats, on the base of trees, rarely on sandy ground; stems villous with a radicular tomentum, creeping, throwing up densely crowded short terete branches, with deeply concave closely imbricated deltoid-ovate slenderly pointed leaves, composed of pellucid elliptical and conspicuously unipapillate cells. Capsule ovate-cylindrical, erect. Lid conical, obliquely rostellate. Peristome double; the outer of 16 linear-subulate white granulate distantly articulated teeth, the inner a carinate membrane half the length of the teeth, without or with rudimentary segments. Flowers dicœcious; male plants as yet unknown.

1. **T. hirtella,** Sulliv. Stems closely creeping, some of them extending beyond the tufts; branches erect, terete, obtuse: leaves concave, round-ovate, abruptly and narrowly acuminate, slightly decurrent at base, very scabrous on the back with simple incurved papillæ; borders spinulose-dentate above, lobate-ciliate toward the base, all the cilia long, curved up, and more or less dentate; costa slender, vanishing in the middle; perichætial leaves numerous, loosely imbricate, the inner oblong-lanceolate, narrowly acuminate, fimbriate in the upper part by long dentate cilia: calyptra dimidiate: capsule thin; pedicel 1 c.m. long; teeth linear, distantly but distinctly articulate, the inner basilar membrane truncate, one third the length of the teeth: spores pale yellow. — Mosses of U. States, 60, and Icon. Musc. 128, t. 80; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 247. *Pterigynandrum hirtellum*, Hedw. Spec. Musc. 89, t. 17. *Hypnum hirtellum*, Muell. Syn. ii. 468.

Hab. Base of trees, Northern and Middle States; not rare and copiously fruiting.

2. **T. asprella,** Sulliv. Differs from the preceding in its glaucous-green color, the leaves bordered nearly all around by longer cilia, the papillæ upon the back bifurcate, not simple and curved, and the teeth longer, with nodose articulations. — Mosses of the U. States, 60, and Icon. Musc. 129, t. 81. *Leskea asperella*, Schimp. in Bryol. Eur. *Leskea*, 2.

Hab. Same as the last, and sometimes found growing with it.

3. **T. robusta,** Duby. With mode of growth and habit of *T. hirtella*, differing in the unilateral very crowded branchlets, the leaves strongly bicostate to above the middle, rarely simply costate, the cells of the areolation elliptical in the middle of the leaves, quadrate on the borders, the lower longer, and all with globose papillæ, and in the segments of the inner peristome granulate and obtuse. — Regensb. Flora, lviii. 284 (1875).

Hab. Florida (*Chapman*, in Herb. Delessert).

4. **T. Lescurii,** Sulliv. Closely resembling *T. asprella*, distinguished by its glaucous-green or whitish color, the stems subfasciculate and more loosely divided in longer branches, the leaves with a shorter acumen, not ciliate-fimbriate on the borders, the papillæ of the back cut star-like into three or four lobes, the capsule longer and narrower, on a longer pedicel, the teeth shorter and with less distinctly nodose articulations, and the

inner membrane longer and more or less distinctly divided into short segments. — Mosses of U. States, 60, and Icon. Musc. 130, t. 82; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. 249.

HAB. On dry sandy ground, rarely on trees; Southern States.

119. MYURELLA, Bruch & Schimp. (Pl. 5.)

Small fine mosses, with stems irregularly divided into erect julaceous branches, soft when damp, very brittle when dry. Leaves closely imbricate, glaucous-green, round-ovate, obtuse or apiculate, very concave, minutely serrulate, more or less distinctly papillate on the back; costa double, very short; areolation small, rhomboidal above, quadrate or rectangular at base. Flowers dicœcious; perichætium long, dirty brown. Calyptra very small, fugacious. Capsule long-pedicellate, suberect, small, inflated at the neck, oval-oblong. Lid large, conical, blunt or obscurely apiculate. Peristome comparatively large, perfect; teeth articulate, transversely striolate, yellowish; segments entire, as long as the teeth, with two intermediate shorter cilia. Annulus double.

1. **M. julacea**, Bruch & Schimp. In dense compact glaucous-green tufts, pale yellow within; stems erect, dichotomous or fasciculate-branching: leaves round-ovate, obtuse, rarely short-apiculate, minutely serrate, nearly smooth: capsule pale brown, with orange lid. — Bryol. Eur. t. 560. *Hypnum julaceum*, Villars, Pl. Dauph. iii. 909; Schwaegr. Suppl. i. 2. 216, t. 89.

HAB. Fissures of rocks on high mountains; New England and New York, Oregon, British America, etc.; rare.

2. **M. apiculata**, Bruch & Schimp. Tufts less compact and wider, soft, glaucous-green: leaves loosely imbricate or spreading, smaller, abruptly narrowed into a recurved point, opaque: peristome small, whitish. — Bryol. Eur. t. 560. *Isothecium apiculatum*, Hueb. Musc. Germ. 598. *Hypnum julaceum*, var., Muell. Syn. ii. 465.

HAB. British America (*Drummond*); Uinta Mountains (*Watson*).

3. **M. Careyana**, Sulliv. Tufts less compact, glaucous-green, dirty white below, intermixed with long rootlets; stems slender, ascending, stoloniferous and fasciculately branching:

leaves loosely imbricate, open-erect, broadly ovate, narrowed to a long acumen, spinulose-dentate all around, with long papillæ on the back; costa very short or none; cells of the areolation somewhat large, pellucid, all rhomboidal, elliptic, simply papillose on the outside; perichætial leaves sheathing, lanceolate, long filiform-acuminate, coarsely dentate: capsule subincurved, oblong-obovate; teeth pale yellow. — Mosses of U. States, 61 and 81, t. 5, and Icon. Musc. 131, t. 83; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 250.

Hab. Mountains of New England (*Cary, Frost*); New York (*Austin*); Pennsylvania (*Lesquereux*); crevices of wet limestone rocks, North Carolina (*Gray, Sullivant*). Recently discovered also in Central Europe.

120. LESKEA, Hedw. (Pl. 5.)

Primary stems leafy, irregularly divided; branches erect or spreading. Stem- and branch-leaves similar, ovate-lanceolate, open or spreading, rarely secund, soft, costate, papillose on both sides. Flowers monœcious and diœcious. Capsule oblong, subcylindrical, straight or subarcuate, thin. Teeth of the peristome narrowly lanceolate; segments narrow, linear; cilia none.

1. **L. polycarpa,** Ehrh. Monœcious: tufts widely intricate, dirty green; stems long, creeping, soft; branches erect, varying in length: leaves open or subsecund, ovate-lanceolate, concave; borders recurved below; costa vanishing below the apex: capsule oblong, cylindrical, slightly arcuate, constricted under the orange-colored orifice when dry; lid narrowly conical; teeth long, linear-lanceolate, yellowish; segments narrowly linear-subulate, entire, hyaline, as long as the teeth; annulus narrow. — Crypt. Exsicc. n. 96; Bryol. Eur. t. 470.

Var. **paludosa,** Wils. More robust; stems and branches longer; branches erect: leaves larger, spreading-open, less crowded: capsule longer, cylindrical. — *L. paludosa,* Hedw. Musc. Frond. iv. 1, t. 1.

Hab. Roots and trunks of trees and bushes, in wet places and borders of rivulets; not rare. Oregon (*Hall*).

2. **L. obscura,** Hedw. Monœcious: plants small, loosely and widely intricate, cespitose, dark green; stems prostrate, subpinnately divided; branches erect and compressed: leaves open-erect, loosely incumbent, ovate at base, narrowed above

to a blunt apex, concave, recurved on the borders, strongly costate nearly to the apex; areolation opaque, round; inner perichætial leaves long-sheathing, loosely areolate, costate: capsule erect, oblong or narrowly elliptical, slightly arched, thin, reddish brown when old; pedicel 1½ to 2 c.m. long; lid conical, blunt at the apex; teeth linear-lanceolate, distantly articulate; segments shorter, linear, slender, keeled, and cleft between the articulations. — Spec. Musc. 223, t. 57; Sulliv. Icon. Musc. 123, t. 77. *L. nervosa*, Sulliv. Musc. Allegh. n. 69. *L. microcarpa*, Schimp.; Sulliv. Mosses of U. States, 59.

Hab. On the roots and lower portions of the trunks of trees in low ground, and reached by inundations; common and variable.

3. **L. nervosa,** Myrin. Dicœcious: plants in dense dark green or brownish mats; stems pinnately divided into crowded ramulose branches, either short and erect or long and creeping: leaves close, open when moist, imbricate when dry, often turned to one side, narrowly lanceolate or acuminate from an ovate base, plano-concave in the middle, reflexed on the borders; costa solid, percurrent; cells of the areolation small, round-oval, transversely quadrangular at the basilar borders; inner perichætial leaves long-sheathing, long-acuminate: capsule oblong-cylindrical, regular, brown; operculum narrowly conical or short-beaked; peristome short; outer teeth linear-lanceolate, whitish; segments short, subulate, irregular; annulus narrow. — Coroll. Fl. Ups. 52; Bryol. Eur. t. 472; Sulliv. Mosses of U. States, 105. *Pterogonium nervosum*, Schwaegr. Suppl. i. 102, t. 28.

Hab. Trunks of trees; White Mountains, generally sterile; Crawford Notch, fruiting (*James*); rare.

4. **L. denticulata,** Sulliv. Dicœcious: plants in small loose light green tufts; stems short, creeping, irregularly branching, radiculose: leaves close, appressed, open, erect or subsecund, ovate-lanceolate, narrowly short-acuminate, minutely denticulate all around, concave, ecostate, pellucid; areolation narrowly oblong, the basilar broader and shorter: male plants unknown: capsule oval-oblong, suberect, short-pedicelled; operculum short-rostrate from a broad highly convex or conical base; teeth linear-lanceolate, distantly articulate; segments nearly as long and as broad as the teeth, carinate, cleft between the articulations; cilia none; annulus none. — Musc. Allegh. n. 62, Mosses

of U. States, 59, and Icon. Musc. 125, t. 78; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 245. *Hypnum fabroniæfolium*, Muell. Syn. ii. 271.

HAB. Base of trees, Middle and Southern States; rare in fruit.

5. **L. tristis,** Cesat. Plants widely cespitose, loosely intricate, dirty green; stems slender, prostrate or pendent, branching and irregularly or pinnately ramulose; branchlets erect or curved, filiform: leaves very brittle, squarrose when moistened, narrowly lingulate, obtuse or short-apiculate from a broad suberect clasping base, crenulate on the margins by large protuberant cells; surface verruculose; costa slender, vanishing at the middle; upper areolation irregularly round-hexagonal, oblong-rectangular in the middle toward the base, transversely hexagonal near the borders: fruit unknown. — DeNot. Syll. 67. *L. fragilis*, Hook. & Wils. in Drumm. Musc. Amer. (Coll. II.), n. 101; Sulliv. Musc. Allegh. n. 71. *Anomodon* (?) *tristis*, Sulliv. Mosses of U. States, 58.

HAB. Common on trees in wooded swamps and along rivulets, particularly on Hornbeam.

6. **L. Austini,** Sulliv. Monœcious: plants of medium size, intricate-cespitose; stems irregularly divided into very unequal branches: leaves spreading or subsquarrose when moistened, ovate, long and narrowly acuminate, entire, costate to above the middle, papillose on both faces; cells thick, round-quadrate near the basal border, longer, rhomboidal-elliptical above; perichætial leaves longer, lanceolate-acuminate: capsule erect, cylindrical-oval, with a small orifice; teeth comparatively short, broadly lanceolate, attached far below the orifice, papillose on both faces, opaque; inner membrane yellowish brown, scarcely passing above the orifice of the capsule, undivided; lid short-conical; annulus none. — Icon. Musc. Suppl. 81, t. 61.

HAB. Stone walls, New Jersey (*Austin*); trunks of trees, Illinois (*Wolf*).

The generic position of this species is still uncertain, related as it is in some characters to *Leskea*, in others to *Habrodon*.

7. **L. pulvinata,** Wahl. Synœcious: plants soft, cespitulose, irregularly ramose and ramulose: leaves ovate-lanceolate, slightly unequilateral, very entire, obsoletely costate, soft and smooth; areolation loose, rhomboidal-quadrate at the angles and margins, chlorophyllose; perichætial leaves ecostate, longer, half-sheathing, with a narrower areolation: calyptra whitish,

dimidiate: capsule soft, oblong, regular or slightly inclined, thin, on a short soft pedicel; teeth narrowly lanceolate, thin, hyaline; segments linear, carinate-plicate, orange, shorter than the teeth, solid and narrow; membrane broad. — Fl. Lapp. 369; Bryol. Eur. t. 471. *Neckera pulvinata*, Muell. Syn. ii. 83. *Myrinia pulvinata*, Schimp. Syn. 482.

Hab. Canada and British Columbia, on trees (*Macoun*); very rare.

Schimper separates this species from *Leskea* as a new genus, *Myrinia*, on account of the loose and smooth areolation of the leaves.

8. **L. Wollei**, Aust. Plants very small, intricately cespitose, irregularly or subpinnately ramose and ramulose, greenish brown above, reddish below: leaves of the primary stems broadly deltoid-ovate, abruptly long-acuminate, those of the branches narrower and shorter acuminate, those of the branchlets somewhat rigid, ovate, acute or short-acuminate, concave, imbricate, slightly rugulose when dry, all very entire; costa broad, simple and longer, or unequally bifid; cells rhomboidal; those of the basilar angles and of the borders quadrate up to the apex: fruit and flowers unknown. — Bull. Torr. Club, v. 22.

Hab. Niagara Falls (*Wolle*); Lake Superior (*Macoun*).

A very uncertain species, on which the author remarks that it is of about the size and has much the general appearance of *Hypnum adnatum*; the leaves much as in that species in position, shape and areolation, but more concave, and the areolation shorter; the stem-leaves shaped somewhat as in *Hypnum hispidulum*, but more concave, with a more abrupt longer and more flexuous point, and with entire margins. In a small fragment communicated by the author, the leaves are found to be nerveless or the costa bifid at base, as in *Hypnum adnatum*. It appears to be a variety of that species.

121. ANOMODON, Hook. & Tayl. (Pl. 5.)

Primary stem creeping, stoloniferous; fertile branches erect; branchlets fasciculate or irregular. Stem-leaves distant, minute, hard; those of the branches more crowded, spreading or secund; areolation minute, very chlorophyllose, papillose on both faces (except in *A. Toccoæ*). Flowers dicœcious. Calyptra long. Capsule erect, oblong or cylindrical, regular, chestnut-colored, coriaceous. Teeth pale, linear-lanceolate; segments short, linear, more or less irregular from a narrow membrane. Annulus narrow or none.

1. **A. rostratus,** Schimp. Densely cespitose; tufts bright green at the surface, ochreous within; primary stems fasciculately ramose, brittle, with filiform innovations: leaves densely imbricate, ovate at base, narrowly lanceolate and long-apiculate, with a solid costa vanishing below the apex; perichætium long, whitish, with thin ecostate leaves, the inner narrowed into a filiform reflexed point as long as the leaves: capsule short-pedicellate, oval-oblong, reddish-brown; lid long-beaked; segments nearly as long as the teeth, carinate, dirty yellow, with cilia solitary or rudimentary or none. — Syn. 488. *Leskea rostrata*, Hedw. Spec. Musc. 226, t. 55; Bryol. Eur. t. 473; Sulliv. Mosses of U. States, 59.

HAB. Roots of trees, in woods; not rare.

2. **A. attenuatus,** Hueben. Plants in loose wide tufts; secondary stems fasciculately râmose, incurved at the apex, mixed with flagelliform sometimes very long stolons: leaves subsecund, narrowed and decurrent at the ovate base, lanceolate above, blunt and apiculate at the apex, very densely papillose on both faces; perichætial leaves lanceolate-acuminate from an ovate base: capsule long, cylindrical, straight or slightly curved, reddish brown, shining; pedicel long, twisted; teeth narrowly lanceolate; segments filiform, fragile and irregular; annulus narrow. — Musc. Germ. 562; Bryol. Eur. t. 475. *Leskea attenuata*, Hedw. Musc. Frond. i. 33, t. 12. *Hypnum attenuatum*, Schreb.; Muell. Syn. ii. 473.

HAB. On rocks, roots and trunks of trees where mud is deposited by inundations; very common along rivers.

3. **A. obtusifolius,** Bruch & Schimp. Loosely and widely cespitose, glaucous-green, dirty red when old; primary stems creeping, flagellate, the secondary straight, simple or divided at base: leaves two-ranked, lingulate-obtuse from an oblong-ovate base, thick, opaque, minutely round-areolate; costa pellucid, vanishing below the apex; upper perichætial leaves long-sheathing, longer lingulate at the apex: capsule short, ovate or elliptical, on a short pedicel; teeth nodose-articulate, linear-lanceolate and subulate; segments very short from a very narrow membrane, often abortive; annulus large. — Lond. Journ. Bot. ii. 668 (1843); Sulliv. Icon. Musc. 119, t. 74. *A. minor*, Fuern.; Lindb. Faun. Fl. Fenn. ix. 267.

HAB. On trunks of trees, near water-courses, in the Middle States; common.

4. **A. apiculatus,** Bruch & Schimp. Differs from the last in the stems more divided and less flattened, the leaves more densely areolate, and covered with longer papillæ, auriculate and fimbriate-papillose at base, and the borders undulate, the capsule longer and without annulus. — Bryol. Eur. *Anomodon*, 6; Sulliv. Mosses of U. States, 58, and Icon. Musc. 120, t. 75. *Hypnum Rugelii*, Muell. Syn. ii. 473, fide Lindb.

HAB. On decayed logs, in mountain districts.

5. **A. viticulosus,** Hook. & Tayl. Plants large, in wide tufts, dark green above, ochreous within; primary stems long, creeping, the secondary erect, simple, or geniculate by repeated innovations: leaves secund and subfalcate, crispate when dry, ovate-lanceolate, blunt at the apex; areolation very dense and minutely papillose; perichætial leaves long, linear-acuminate from an ovate base; costa strong: capsule long-cylindrical, straight or slightly curved; pedicel twisted; operculum narrowly conical; teeth narrowly lanceolate, sometimes irregular; segments filiform, fragile and irregular; annulus of a double row of small cells. — Musc. Brit. ed. 2, 138, t. 22; Bryol. Eur. t. 476. *Hypnum viticulosum*, Linn. Spec. Pl. 1127.

HAB. Shaded rocks; Niagara Falls, sterile; Wisconsin (*Lapham*); Owen Sound, Canada, fertile (*Mrs. Roy*).

6. **A. Toccoæ,** Sulliv. & Lesq. Habit, mode of growth and color as in *A. apiculatus:* primary stems prostrate, naked or beset with few small leaves and few radicles, the secondary erect, simple or irregularly divided into short branches, densely foliate, arched when dry: leaves open, erect, lanceolate-acute from an ovate-oblong base, coarsely and unequally dentate toward the apex, plicate at base and reflexed on the margins; meshes of the areolation very small, not papillose, round-quadrate, in oblique rows; costa stout, terete, subpercurrent; upper perichætial leaves lanceolate, gradually narrowed into a long filiform acumen, costate: fruit unknown. — Musc. Bor.-Amer. Exsicc. n. 240; Sulliv. Mosses of U. States, 58, and Icon. Musc. 121, t. 76, A.

HAB. On rocks, near the base of Toccoa Falls, Northern Georgia (*Lesquereux*).

7. **A. Californicus,** Lesq. Loosely cespitose, dirty yellow above, brown below; secondary stems branching by innovations, or continuous and simple, slender, angular when dry by the appressed imbricated four-ranked leaves: leaves open when

moistened, half-clasping and decurrent at the auriculate base, broadly ovate, acute, replicate on the margin to above the middle, reflexed to the point, carinate by the stout pale subpercurrent costa; alar cells oblong, the upper ovate-quadrate, papillose on both faces; auricles denticulate-spinose: fruit unknown. — Mem. Calif. Acad. i. 30.

Hab. Monte Diablo, California (*Bolander*).

The base of the leaves is rounded into a large ciliate auricle, as in *A. apiculatus*, and the margins above are also minutely denticulate by the protrusion of the papillate cells, but this is the only point of affinity between the species, the leaves being broadly ovate-acute, carinate, and imbricate all around when dry.

Tribe XXII. ORTHOTHECIEÆ.

Plants generally large, widely spreading and cespitose, creeping and ramulose; branches erect or complanate. Leaves smooth, sometimes sulcate, costate or ecostate or bicostate at base; areolation narrowly rhomboidal or linear, large and quadrate at the basal angles. Capsule erect or subinclined.

122. PLATYGYRIUM, Bruch & Schimp. (Pl. 5.)

Plants intricate, cespitose, pinnately ramulose. Leaves densely crowded, spreading when moistened, imbricate when dry, subscarious, glossy, ecostate; areolation narrowly rhomboidal above, sublinear in the middle, larger and quadrate at the angles. Flowers dicœcious. Calyptra dimidiate, long, twisted. Capsule oblong, cylindrical and regular. Operculum long and narrowly conical, blunt at the apex, smooth. Teeth of the peristome free to below the orifice of the capsule, narrowly lanceolate, hyaline on the borders; segments free to the base, narrow, linear, as long as the teeth; cilia none. Annulus very large, compound, persistent.

1. **P. repens,** Bruch & Schimp. Tufts bright yellowish green: leaves ovate or oblong-lanceolate, acute, concave, recurved on the borders, very entire; perichætial leaves loosely imbricate, longer: capsule dirty yellow, brown when old; teeth orange, hyaline on the borders; segments of the same color. — Bryol. Eur. t. 458. *Pterigynandrum repens*, Brid. Musc. Recent. Suppl. i. 131. *Pterogonium*, Schwaegr. Suppl. i. 100, t. 27.

HAB. Decayed trunks, in woods; common.

Much like *Pylaisia polyantha*, differing in its bright yellowish green color, the leaves broader and shorter, imbricate when dry, and the regular capsule more solid.

123. PYLAISIA, Bruch & Schimp. (Pl. 4.)

Stems creeping, pinnately ramulose; branchlets short, erect. Leaves close, spreading or subsecund and falcate, ecostate, concave, entire or slightly serrulate, glossy. Flowers monœcious. Capsule ovate-oblong or subcylindrical, slightly curved when dry. Teeth of the peristome linear-lanceolate, more or less densely articulate, solid, hyaline on the borders; segments attached to a short membrane, longer than the teeth, linear-subulate, cleft along the keel or bipartite; cilia rudimentary or none. Annulus narrow. — *Pylaiea*, Lindb.

1. **P. polyantha**, Bruch & Schimp. Leaves erect, spreading, ovate-lanceolate, long-acuminate: capsule chestnut-color; cilia very short. — Bryol. Eur. t. 455. *Hypnum polyanthos*, Schreb. Spicil. Fl. Lips. 97; Muell. Syn. ii. 337. *Leskea polyantha*, Hedw. Musc. Frond, iv. 4, t. 2. *Stereodon polyanthus*, Mitt. Journ. Linn. Soc. viii. 40.

HAB. On trees; White Mountains (*James*); Santa Fe (*Fendler*); Saskatchewan and Rocky Mountains (*Bourgeau*). Rare.

2. **P. heteromalla**, Bruch & Schimp. Much like the preceding, differing in its pale yellowish color, the leaves broadly ovate, acuminate, subscarious, erect on the borders, the cells of the areolation very pale, narrow, subconfluent, those of the basilar angles few, very small and slightly granulose, the inner perichætial leaves enlarged at base, the capsule oval and broader, and the operculum shorter. — Lond. Journ. Bot. ii. 669 (1843). *Hypnum polyanthum*, var. *pallidifolium*, Muell. Syn. ii. 337.

HAB. Trunks of trees and stones, in various situations; Rocky Mountains (*Drummond*, n. 222).

3. **P. subdenticulata**, Schimp. Plants glossy-green, small, in closely entangled mats; branchlets crowded, short and slender: leaves not crowded, ovate-lanceolate, more or less long-acuminate, concave, slightly serrulate at the apex; alar cells numerous, subgranulose; perichætial leaves sheathing, loosely areolate, narrowly acuminate: capsule oblong-cylindrical and

symmetrical; lid rostrate from a conical base; teeth distantly articulate; segments yellow, cleft and bifid, attached to a broad membrane; cilia none: spores bright yellow. — Bryol. Eur. *Pylaisœa*, 3; Sulliv. Icon. Musc. 137, t. 87. *P. denticulata*, Sulliv. Mosses of U. States, 62.

Var. **obscura.** Plants dirty green; tufts strong, compact: leaves closely imbricate, shorter; the perichætial short-acuminate, entire: lid short, whitish. — *P. Jamesii*, Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. ed. 2, n. 383.

HAB. On the bark of trees, Central Ohio (*Sullivant*); New Jersey (*Austin*); the variety on the ground and roots of trees, near Chelsea, Massachusetts (*James*).

Sullivant remarks, l. c., that the species is very near slender forms of *P. polyantha*, distinguished by the larger shorter-pointed leaves, the cells broader and shorter, those of the angles more numerous, and the beak of the lid longer.

4. **P. intricata,** Bruch & Schimp. Size and mode of growth as in *P. subdenticulata;* branches short, recurved: leaves ovate-lanceolate, acuminate, slightly denticulate at the apex, the upper secund; angular cells quadrate, numerous: capsule oblong-ovate, turgid, narrower at the orifice; operculum conical, short-rostellate; segments granulated, adhering to and bordering the lower half of the teeth, split above and free, as in species of *Bartramia:* spores large. — Bryol. Eur. *Pylaisœa*, 3; Sulliv. Mosses of U. States, 62, and Icon. Musc. 139, t. 88. *Pterigynandrum intricatum*, Hedw. Spec. Musc. 85, t. 18.

HAB. Trees and old logs; common in woods.

5. **P. velutina,** Bruch & Schimp. l. c. Differs from the last, with which it has often been confounded, in the somewhat narrower leaves with few quadrate alar cells, the capsule cylindrical with a broad orifice and longer operculum, the teeth more densely articulate, narrowly bordered their whole length by the adhering segments, and the spores dark yellowish green, larger and granulated. — Sulliv. Mosses of U. States, 63, and Icon. Musc. 140, t. 89.

HAB. Bark of trees; often growing with the last.

124. HOMALOTHECIUM, Bruch & Schimp. (Pl. 5.)

Plants varying in size, prostrate, closely and pinnately branched. Leaves glossy, costate, serrulate; areolation oblong-

rhomboidal. Calyptra cuculliform, hairy. Operculum conical, subrostellate. Capsule cylindrical-ovate or oblong, regular, erect, or somewhat arcuate. Teeth of the peristome linear-lanceolate, closely articulate; segments adhering to the teeth and bordering them.

1. **H. subcapillatum,** Sulliv. Monœcious: leaves open-erect, subimbricate, elliptical or obovate, abruptly narrowed to a slender recurved acumen; costa short, simple or forking, vanishing below the middle; alar cells numerous, quadrate; inner perichætial leaves sheathing, long-acuminate, dentate at the apex: pedicel rough: capsule slightly incurved; teeth confluent at base, dark red, with a broad pellucid central stripe marked by a delicate medial line; segments lining the teeth. — Mosses of U. States, 63, t. 5, and Icon. Musc. 141, t. 90. *Pterigynandrum subcapillatum*, Hedw. Spec. Musc. 83, t. 16.

Hab. Bark of trees in woods, with the last two species of *Pylaisia.*

2. **H. pseudosericeum.** Dicœcious: loosely cespitose, irregularly branching, glossy; branchlets short and short-cuspidate, slightly curved, turgid: stem-leaves loose, spreading, slightly decurrent, rounded at base, gradually narrowed into a long acute or cuspidate often half-twisted acumen, irregularly and indistinctly sulcate, deeply concave, revolute on the borders from the base to the middle, obscurely denticulate; costa narrow, vanishing in the point; cells pale, inflated, narrowly linear; outer perichætial leaves small, lingulate, obtuse, the inner broad and sheathing at base, gradually narrowed into a long narrow denticulate point, nerveless: capsule tuberculose above, suberect or slightly inclined, abruptly arcuate, cylindrical, constricted at the orifice; pedicel short, reddish, often very flexuous; lid conical, obliquely rostellate; teeth robust, ferruginous; inner membrane thin, yellow; cilia one or two. — *Hypnum pseudosericeum*, Muell. Regensb. Flora, lviii. 89 (1875); Watson, Bot. Calif. ii. 412.

Hab. Oakland and Portland, Oregon (*R. D. Nevius*).

125. CYLINDROTHECIUM, Bruch & Schimp. (Pl. 5.)

Plants large, widely cespitose; stems generally compressed, subpinnately ramulose. Leaves crowded, more or less compressed, imbricate, costate, glossy, entire, with a linear very

narrow areolation quadrate at the basal angles. Calyptra cucullate and dimidiate. Capsule long-pedicellate, erect, cylindrical. Operculum conical or obliquely short-rostrate. Peristome small; teeth free to below the orifice of the capsule, linear, distantly articulate; segments narrow, carinate, attached to a narrow membrane or entirely free; cilia none. Spores greenish brown, minute.

1. **C. cladorrhizans,** Schimp. Plants in wide yellowish green tufts: leaves closely imbricate, oblong-ovate, acute, very slightly serrulate at the apex, concave, indistinctly bicostate at base: lid long, conical, blunt at the apex; teeth entire, dark brown at base, more or less lacunose above; segments linear, pale, entire; annulus large, easily detached. — Syn. 514; Sulliv. Mosses of U. States, 64, t. 5, and Icon. Musc. 143, t. 91. *Neckera cladorrhizans*, Hedw. Spec. Musc. 207, t. 47. *C. Schleicheri*, Bruch & Schimp. Bryol. Eur. t. 464.

Hab. In woods on decayed logs, roots of trees and the ground; very common.

2. **C. seductrix,** Sulliv. Very near the preceding, distinguished by the darker color of the stems, the smaller terete and more slender branchlets, the leaves sulcate, more concave and shorter-apiculate, the capsules more numerous and narrower, the deeper insertion of the shorter loosely articulate teeth, and the less perfect persistent annulus. — Mosses of U. States, 64, and Icon. Musc. 145, t. 92. *Neckera seductrix*, Hedw. Spec. Musc. 208, t. 47. *Pterigynandrum Carolinianum*, Brid. Musc. Recent. Suppl. i. 132. *C. Muhlenbergii*, Bruch & Schimp. Bryol. Eur. *Cylindrothecium*, 4.

Hab. On logs in moist shaded places; fruiting more copiously than the last species; common.

3. **C. brevisetum,** Bruch & Schimp. l. c. Facies and mode of growth of *C. cladorrhizans;* branches, branchlets and leaves less compressed: leaves erect, open, concave, lanceolate, gradually narrowly acuminate, with borders recurved in the lower part; areolation looser: capsule enlarged toward the base or oval-cylindrical; operculum conical, obtuse; pedicel short, pale yellow; teeth hyaline-margined by the adhering segments; annulus very large: spores large. — Sulliv. Mosses of U. States, 65, and Icon. Musc. 150, t. 96. *Neckera breviseta*, Hook. &

Wils. in Drumm. Musc. Amer. (Coll. II.), n. 95; Wils. in Hook. Journ. Bot. (1842) iv. 419, t. 24, A.

HAB. Bark of prostrate trees; Northwestern slope.

Not as common as *C. cladorrhizans*, from which it is distinguished at first sight by the shorter yellow pedicel of the capsule.

4. **C. Floridanum**, Duby. Stems prostrate, dirty green; branches close, irregular, with short erect branchlets: leaves subpellucid, imbricate, ecostate, narrowly lanceolate, acute or acuminate, minutely serrulate at the apex; perichætial leaves long-lanceolate, very entire: pedicels clustered (3 or 4), erect, strict, bright purple, slightly enlarged under the capsule: capsule brown, horizontal or suberect, ovate; operculum rostrate, acute from a conical base, a little incurved; peristome and areolation as in *C. seductrix*. — Regensb. Flora, lviii. 284 (1875).

HAB. Florida (*Chapman*).

The author compares it to *C. seductrix*. This may be right for some of the characters, but the horizontal ovate clustered capsules and the narrowly lanceolate-acuminate leaves are characters not accordant with those of the genus.

5. **C. compressum**, Bruch & Schimp. l. c. Plants in flat intricate mats; branches and branchlets much compressed: leaves shorter and broader than in *C. cladorrhizans*, more concave and more obtuse at the entire apex: capsule shorter-ovate or elliptical, with a narrow orifice, shorter-pedicellate; lid longer, with a slender curved beak; teeth long, closely articulate; annulus large, easily detached. — Sulliv. Mosses of U. States, 64, and Icon. Musc. 147, t. 93. *Leskea compressa*, Hedw. Spec. Musc. 232, t. 56. *Entodon compressus*, Muell.; Lindb. Manip. Musc. i. 68.

HAB. Roots of trees, near water courses; Pennsylvania to Missouri, Ohio and Southern States; rare.

6. **C. Drummondii**, Bruch & Schimp. l. c. Size and aspect of *C. cladorrhizans*, but easily recognized by its more flattened branches and branchlets, of a delicate yellow color, the leaves longer, distinctly denticulate, serrulate toward the apex, the areolation looser, the basilar cells oblong, nearly equal and filling the whole base, the capsule shorter, inflated at the neck, abruptly narrowed to a pale yellow pedicel, the teeth obliquely striolate, and the annulus wanting. — Sulliv. Mosses of U. States, 64, and Icon. Musc. 148, t. 94. *Neckera cladorrhizans*, Hook.

& Wils. in Drumm. Musc. Amer. (Col. II.), n. 96. *C. Rugelianum*, Schimp. in Bryol. Eur. l. c.

HAB. Stones and decayed logs in woods; Southern States.

7. **C. Sullivantii,** Sulliv. Plants more slender, thinner and narrower than in the last species; branches and branchlets less compressed, longer, sometimes round and filiform at the apex: leaves close, narrowly ovate-lanceolate, obtusely acute, serrulate at the apex: capsule slender, subcylindrical, on a reddish pedicel; operculum long and narrowly rostrate; teeth closely articulate, vertically lineate; annulus large. — Mosses of U. States, 64, and Icon. Musc. 149, t. 95. *Neckera Sullivanti*, Muell. Syn. ii. 65. *C. gracilescens*, Schimp. l. c.

HAB. Shady woods, on stones near the surface of the ground, or on damp rocks; Western North Carolina (*Gray, Sullivant*); along the French Broad River, Tennessee (*Lesquereux*); rare.

8. **C. concinnum,** Schimp. In wide yellowish green tufts; stems erect, regularly pinnate-ramulose: leaves spreading, imbricate when dry, broadly ovate or ovate-oblong, muticous, concave, reflexed toward the base, incurved above: calyptra descending to below the base of the capsule, dimidiate nearly its whole length: capsule erect, short-necked, cylindrical; lid conical, obtuse; teeth linear, perforated between the articulations; segments cleft, pale; annulus very narrow. — Syn. 515. *Hypnum concinnum*, DeNot. Mant. n. 18. *C. Montagnei*, Bruch & Schimp. Bryol. Eur. t. 465.

HAB. Colorado.

126. CLIMACIUM, Web. & Mohr. (Pl. 5.)

Plants large, tree-like, arising from a subterranean radiculose stem; primary branches erect, simple below, fasciculately branching above. Leaves of the primary branches squamiform; those of the divisions crowded, erect-spreading, imbricate when dry, decurrent, thinly costate. Flowers dicœcious or abnormally monœcious; perichætial leaves long-sheathing. Fruit clustered. Calyptra dimidiate, long, embracing the base of the pedicel. Capsule long-pedicellate, erect, cylindrical-oblong. Operculum rostrate. Teeth confluent above the orifice of the capsule, linear-lanceolate, closely articulate; segments arising from a very narrow membrane, as long as the teeth, cleft between

the articulations, bipartite when old. Annulus none. Spores very small.

1. **C. dendroides,** Web. & Mohr. Leaves ovate-oblong, lanceolate, concave, bisulcate, serrate at the apex, slightly decurrent and hollowed at the basal angles, costate to below the apex, bright green and glossy; perichætial leaves thinner, more loosely areolate, entire, the inner sheathing: capsules numerous, ovate-oblong, chestnut-color; lid rostrate-acuminate, remaining attached to the columella; teeth united into a cone when damp, incurved between the segments when dry: spores olive green. — Iter. Suec. 96; Bryol. Eur. t. 437. *Hypnum dendroides*, Linn. Sp. Pl. 1128. *Leskea dendroides*, Hedw. Spec. Musc. 228. *Neckera dendroides*, Muell. Syn. ii. 122.

Hab. Wet prairies, borders of ditches, etc.; very common in Europe, rare in America. British America (*Drummond*); Fort Colville (*Lyall*); White Mountains (*Oakes*); Canada (*Macoun*); Sand Lake, New York (*C. H. Peck*).

2. **C. Americanum,** Brid. Closely allied to the last: leaves long-decurrent and more broadly auriculate at base, coarsely serrate above, round-areolate at the broad auricles; perichætial leaves erect, longer acuminate: capsule longer, cylindrical, erect or slightly curved; operculum longer and abruptly rostrate; teeth longer and abruptly long-subulate from a lanceolate base, dark orange. — Musc. Recent. Suppl. ii. 45; Sulliv. Mosses of U. States, 66, and Icon. Musc. 151, t. 97. *Neckera dendroides*, var. *Americana*, Muell. l. c.

Hab. Shady woods in damp places; decayed logs, roots of trees, etc.

3. **C. Ruthenicum,** Lindb. Mode of growth of *Climacium;* branches pinnate or bipinnate; branchlets filiform, slender: leaves of the primary stems squamiform, clasping the stem, broadly ovate, obtuse, apiculate, very entire, strongly costate or ecostate; branch-leaves lanceolate from an enlarged base, serrate from below the middle; costa thick, dark, dentate at the apex; perichætial leaves broadly ovate at base, long-cuspidate, with borders undulate or erose above: capsule cernuous and horizontal, oblong-cylindrical, arcuate, inflated at the neck; pedicel comparatively short, reddish; operculum broad, long-conical, acute; teeth broadly lanceolate, hyaline-margined; segments broad, as long as the teeth, cleft between the articulations. — Act. Soc. Fenn. x. 248; Sulliv. Icon. Musc. Suppl. 77,

t. 58. *Hypnum Ruthenicum*, Weinm. Bull. Soc. Mosc. xviii. 2. 485.

HAB. Sitka (*Bischoff*).

127. ORTHOTHECIUM, Bruch & Schimp.

Plants either small, prostrate and diversely branching and ramulose, or large and fastigiately ramose with few branches and branchlets. Leaves 8-ranked, close, subsecund or erect-spreading, more or less densely imbricate when dry, long-lanceolate, narrowly acuminatê, very entire, ecostate; perichætium loosely vaginate. Flowers dicœcious. Calyptra very small, fugacious. Capsule long-pedicellate, suberect, oval or oblong, straight or slightly incurved. Operculum short-rostrate from a convex base. Teeth of the peristome narrowly lanceolate, subulate, yellowish, hyaline, distantly articulate; segments linear, narrow, as long as or longer than the teeth; intermediate cilia short or none. Annulus large.

1. **O. rufescens**, Bruch & Schimp. Plants tall, in soft irregular reddish yellow tufts; stems with dichotomous branches and few branchlets: leaves erect-open and subsecund, lanceolate, long and narrowly acuminate, sulcate: capsule yellowish brown; membrane and intermediate cilia short. — Bryol. Eur. t. 469. *Hypnum rufescens*, Dicks. Crypt. Fasc. iii. 9, t. 8. *Leskea rufescens*, Schwaegr. Suppl. i. 2. 178, t. 86. *Stereodon rufescens*, Mitten, Journ. Linn. Soc. viii. 40.

HAB. Wet rocks, Davis Strait (*Taylor*).

Although No. 221 of Drummond is reported to be this species, we cannot find in four sets of his collection a specimen agreeing with Schimper's description of the European form. All appear referable to *O. chryseum*.

2. **O. rubellum**. Branches erect, with few branchlets: leaves ovate, concave, with a flexuous apex, revolute on the borders, very shortly bicostate; cells long, the alar indistinct; perichætial leaves ovate-lanceolate. — *Stereodon rubellus*, Mitten, l. c.

HAB. Davis Straits (*Taylor*). Also in the Rocky Mountains (*Drummond*), according to Mitten, mixed with *Catoscopium nigritum* (n. 53).

A small moss, with the habit, appearance, and color of *O. intricatum*, Bruch & Schimp., but differing in its almost exactly ovate leaves, with a short sometimes discolored apiculus, the margins revolute, and the areolation composed of cells which are twice as wide. — (*Mitten.*)

3. **O. chryseum,** Bruch & Schimp. Tufts golden glossy yellow; stems erect, simple or 2–3-parted: leaves strict, lanceolate and ovate-lanceolate, apiculate, concave, deeply plicate: capsule subcernuous, ovate-oblong; lid convex, apiculate; inner membrane very large, ascending to the middle of the teeth; segments carinate, entire; cilia irregular and nodose. - Bryol. Eur. t. 461. *Hypnum chryseon*, Schwaegr.; Muell. Syn. ii. 385. *H. rufescens*, Drumm. Musc. Amer. n. 221. *Stereodon chryseus*, Mitten, l. c. 39.

Hab. Moist rocks among the Rocky Mountains of British America (*Drummond, Bourgeau*), and Arctic-America.

Tribe XXIII. HYPNEÆ.

Plants very variable in size, appearance, ramification, etc., densely or loosely cespitose. Leaves either turned in all directions, open or squarrose, or complanate, or secund, or falcate-secund, of multiple forms, round to narrowly lanceolate, costate or ecostate, subscarious, generally soft and glossy; areolation parenchymatous, the meshes narrowly rhomboidal, linear or vermicular, quadrate and often enlarged at the basal angles. Flowers monœcious or diœcious, very rarely bisexual. Capsule solid, long-pedicellate, cernuous or horizontal, more or less incurved, not pendent, and very rarely erect and regular. Peristome double, perfect, the outer of 16 strong densely articulate lanceolate-acuminate teeth, the inner a broad membrane divided to the middle or about into 16 carinate yellow segments, which are more distantly articulate, entire, or cleft along the keel between the articulations or even their whole length, and generally separated by 1 to 3 articulate or appendiculate cilia.

128. HYPNUM, Dill.

A single polymorphous genus, divided into numerous sections, or subgenera, most of which have been considered by some authors as genera.

Key to the Subgenera.

A. Plants pinnately divided.

* Leaves papillose; paraphyllia more or less numerous.

1. **Pseudoleskea.** Branches long and slender, irregularly pinnately ramulose. Leaves open-erect; areolation compact, punctiform. Capsule subcernuous; cilia slender or none.
2. **Heterocladium.** Stems divaricate and pinnately ramulose. Leaves spreading or recurved, those of the perichætium squarrose; cells punctulate, the medial elongated-oval. Capsule horizontally curved.
3. **Thuidium.** Stem regularly pinnately ramose and ramulose. Stem-leaves smaller; costa translucent. Capsule cernuous· operculum conic-rostrate.

* * Leaves papillose; paraphyllia none.

4. **Claopodium.** Stems in compact tufts, irregularly pinnate-ramulose. Leaves open-erect, denticulate; cells small, oval-fusiform. Capsule turgid, abruptly bent down at the base of the collum.

* * * Leaves smooth; paraphyllia present.

5. **Elodium.** Branches long, pinnately ramulose. Leaves striate; areolation loose, rhomboidal, uniform. Capsule large, cernuous.

* * * * Leaves smooth, bicostate; paraphyllia none.

6. **Tripterocladium.** Stems compressed and branches attenuated, irregularly pinnate. Leaves erect-spreading; cells elliptical, the alar quadrate. Capsule cylindrical, cernuous; cilia solitary, slender.

B. Plants variously divided. Leaves smooth, simply costate (or bicostate in n. 12 and 13).

* Capsule large; lid conical, acuminate.

7. **Camptothecium.** Stem densely subpinnately ramulose. Leaves plicate; areolation very narrow, linear, very small, square or punctiform at the base and angles.
8. **Brachythecium.** Plants large, prostrate, irregularly divided, the branches erect. Leaves costate to the middle or above; areolation loose, elongated-rhomboidal, enlarged at the base and angles.
9. **Scleropodium.** Plants densely cespitose, irregularly branching. Leaves serrulate; areolation short and narrow, vermicular, enlarged and pellucid at the decurrent angles.
10. **Isothecium.** Primary branches dendroid; branchlets stoloniferous or flagellate. Leaves smooth or slightly papillose on the back; areolation very narrow, linear, punctiform at the angles. Capsule oblong, suberect or cernuous; cilia short.

* * Capsule horizontally inclined; lid rostrate.

11. **Eurhynchium.** Plants pinnately ramulose. Leaves cordate, decurrent, serrate; areolation rhomboidal-oval. Capsule turgid-oval.
12. **Raphidostegium.** Plants small; stems prostrate and compressed. Leaves ecostate or shortly bicostate; areolation minute, linear, flexuous, the basilar cells very few and inflated. Capsule suberect or cernuous.

13. **Rhynchostegium.** Stems more or less compressed. Leaves nearly entire, simply costate, rarely shortly bicostate; areolation rhomboidal, somewhat loose, enlarged at base.

14. **Thamnium.** Plants large, dendroid; stem woody. Stem-leaves scarious; branch-leaves strongly dentate; cells minute, round-oval, the basilar longer. Capsules clustered.

C. Plants variously divided. Capsules cernuous, rarely suberect; operculum conic or rostrate.

* Leaves thin, glossy, open, erect or spreading.

15. **Plagiothecium.** Branches few, mostly simple, complanate. Leaves slightly unsymmetrical at base; costa none, or double and very short; areolation rhomboidal-elongated, little enlarged at base. Capsule suberect; operculum conic or rostrate.

16. **Amblystegium.** Stem creeping and widely spreading. Leaves mostly entire, opaque or glossy; costa simple, rarely none; areolation distinct, rhomboidal. Capsule cylindrical-oblong; lid conical.

17. **Campylium.** Stem irregularly divided with pinnate or fastigiate branches. Leaves spreading, subsquarrose; costa short or none; areolation minute, flexuous.

* * Leaves falcate-secund, of solid membranous texture.

18. **Harpidium.** Stems pinnately ramulose. Leaves simply costate to the apex; areolation very narrow, linear, much inflated at the concave basilar angles.

19. **Cratoneurum.** Stems prostrate; branches erect, rigid, villous, pinnate. Leaves simply and strongly costate; areolation dense, linear, oblong at the enlarged base and decurrent angles. Capsule cylindrical, cernuous.

20. **Rhytidium.** Stems large, prostrate, irregularly pinnate with short subuncinate branchlets. Leaves secund and subfalcate, undulate-rugose; areolation compact, linear. Capsule cylindrical, arcuate.

21. **Ctenium.** Branches in compact tufts, pinnately ramulose. Leaves hamate and circinnate-secund. Capsule cylindrical.

22. **Ctenidium.** Plants cespitose; branches erect, appressed, regularly pinnately ramulose. Leaves soft, circinnate-secund. Capsule short, cernuous, solid.

23. **Hypnum,** proper. Plants variously divided; branches more or less densely pinnately ramulose. Leaves obscurely bicostate, membranous, shining; areolation compact, narrowly rhomboidal, distinctly quadrate at the angles. Capsule oblong, erect-cernuous.

* * * Leaves more or less closely imbricate, round or oblong, obtuse or pointed, deeply concave.

24. **Limnobium.** Plants prostrate, irregularly branching. Leaves slightly unequal at the clasping and decurrent base, simply costate or obscurely bicostate. Capsule short, turgid-ovate, cernuous.

25. **Calliergon.** Stem erect, with few terete turgid branches. Leaves very concave, membranous; areolation very compact, narrow, enlarged-quadrate at the angles. Capsule oblong, horizontally curved.

* * * * Plants very large. Leaves turgid, rugulose.

26. **Scorpidium.** Stems irregularly divided. Leaves large, lanceolate-acuminate or broadly oblong and acute or obtuse; areolation very close and narrow; basal cells numerous, quadrate. Capsule cylindrical, arched.

D. Plants large; divisions arcuate, ascending or proliferous; paraphyllia numerous.

27. **Pleurozium.** Stem arcuate, prostrate and proliferous; branches bi-tripinnate. Leaves membranous, shining, shortly bicostate or semicostate; areolation linear, narrow, uniform. Capsule round-ovate.

28. **Hylocomium.** Stems with few branches, pinnately fastigiate-ramulose. Leaves squarrose or reflexed, shortly bicostate; areolation linear, narrow, somewhat enlarged at base. Capsule short, turgid, horizontal.

Subgenus I. PSEUDOLESKEA. (Pl. 6.)

Mode of growth and arrangement of the leaves and paraphyllia as in *Leskea*. Capsule cernuous or horizontal, short, turgid, thick-walled. Teeth of the peristome solid; membrane large; segments as long as the teeth, regular, carinate, cleft between the articulations, generally separated by more or less perfect cilia. — *Pseudoleskea*, Bruch & Schimp.

1. **H. atrovirens,** Dicks. Densely cespitose, dark green; stem much divided and subpinnately ramulose; branchlets flexuous: leaves minutely papillose, open or subsecund, lanceolate from an ovate base, concave, entire, the borders recurved; costa stout, vanishing below the apex; paraphyllia numerous and multiform: capsule cernuous or horizontal, oval or oblong, more or less turgid, dark brown, constricted under the orifice when dry and empty; pedicel smooth, curved above; operculum convex-conical, acute or apiculate; cilia none; annulus very narrow, simple. — Crypt. Fasc. ii. 10; Smith, Engl. Bot. t. 2422. *H. filamentosum*, Dicks. l. c. *Pseudoleskea atrovirens*, Bruch & Schimp. Bryol. Eur. t. 477.

Hab. On rocks; Niagara Falls and Lake Superior (*Macoun*); Lake Huron (*Mrs. Roy*); very rare, and sterile.

2. **H. catenulatum,** Brid. Mode of growth as in the last; leaves very small, spreading when moist, closely imbricate when dry, lanceolate from an ovate base; borders recurved from the middle downward; costa flat, vanishing in the middle; cells small, oval, uniformly oblique at base; paraphyllia filiform,

simple or branching: perichætium whitish, the inner leaves narrowly acuminate, costate: capsule cernuous or subarcuate, oblong; operculum rostrate, yellow; segments entire, separated by one or two thin cilia; annulus compound, broad. — Musc. Recent. Suppl. ii. 154. *Pseudoleskea catenulata*, Bruch & Schimp. Bryol. Eur. t. 478. *Leskea catenulata*, Lindb.

Hab. Mount Ingleborough, New York (*Nowell*, fide Schimper in Syn. ed. 2, 605).

We have never seen an American specimen of this moss, nor can we find trace of the locality given by Schimper.

3. **H. radicosum**, Mitt. Dicœcious: plants intricately cespitose: leaves spreading, loosely intricate, subsecund at the apex of the branches, ovate-lanceolate, acuminate, concave; costa percurrent; borders reflexed, serrulate at the apex; basilar cells narrow, round-quadrate, the upper oblong, soft; paraphyllia lanceolate; perichætial leaves large, erect, convolute, oval, lanceolate-acuminate, the outer ecostate, the inner thinly costate to the middle, serrulate at the apex. — Journ. Linn. Soc. viii. 31. *H. tenax*, Drumm. Musc. Amer. n. 225, not Hedw. *H. congestum*, Wils. Ms., and *Pseudoleskea congesta*, Bruch & Schimp. in Bryol. Eur. *Pseudoleskea*, 2.

Var. **gracilis.** Plants smaller: leaves narrower, longer acuminate: capsule inclined; peristome less perfect. — *Leskea rigescens*, Wils. Ms., referred to *Lescurea* by Bruch & Schimp. in Bryol. Eur. under that genus. *Pseudoleskea rigescens*, Lindb. Act. Soc. Fenn. x. 247.

Hab. Banks of Portage River, British America, on roots of trees near the ground, and the variety in dryer situations, on branches of trees (*Drummond*, n. 225).

Sullivant examined all the specimens given under the above number from four different sets of Drummond's first collection. He remarks, in a note, that the species varies according to habitat. Growing on the roots of trees near the ground, it is more robust and condensed; in dryer situations on the branches of trees, it is more slender and lax. Of the first form are Mitten's specimens, which are sterile and incomplete; of the second are the specimens of three sets from which Wilson made his *Leskea rigescens*.

Subgenus II. HETEROCLADIUM.

Stem vaguely pinnate and ramulose. Stem-leaves cordate-ovate, lanceolate, obscurely short-bicostate, open or subsquarrose, smooth or minutely papillose; medial areolation narrowly

oval, the alar quadrate or transversely oval, not enlarged; branch-leaves much smaller, ovate-acuminate, all minutely serrulate; paraphyllia few, leaf-like. Capsule oval or oblong, curved. Peristome large; cilia 2 or 3. — *Heterocladium*, Bruch & Schimp.

4. **H. dimorphum,** Brid. Dicœcious: plants loosely cespitose, entwining, rigid, yellowish green: stem-leaves ovate-lanceolate, long-acuminate, broadly cordate and decurrent at base, curved back from the middle; costa very obscure, short and geminate; branch-leaves suberect, ovate, concave, obtuse, imbricate; paraphyllia few and small, filiform or oval, ciliate; perichætial leaves long, ecostate, reflexed from the middle, whitish: capsule oblong, incurved or horizontally inclined, slightly constricted under the orifice; lid short, conical-obtuse. — Musc. Recent. Suppl. ii. 149. *Heterocladium dimorphum*, Bruch & Schimp. Bryol. Eur. t. 479.

Hab. White Mountains and Nova Scotia (*James*).

5. **H. procurrens.** Dicœcious: plants yellowish green; stems arcuate, procumbent; branches irregularly pinnate or bipinnate: stem-leaves divergent, compressed, gradually narrowed to a filiform point, minutely serrulate on the borders, with two unequal costæ vanishing in the middle; areolation elongated in the middle of the leaves, oblong on the margins and toward the apex, all smooth and pellucid; branch-leaves unequilateral, obtuse; the perichætial broadly ovate, convolute at the base, spreading at the apex: capsule oval, horizontal, long-pedicellate. — *Pterogonium procurrens*, Mitten, Journ. Linn. Soc. viii. 37, t. 7.

Hab. British America (*Drummond*).

Of looser habit than the last. Pedicel an inch long.

Subgenus III. THUIDIUM. (Pl. 6.)

Primary stems densely rooting, the secondary 1–3-pinnately-ramulose. Stem-leaves larger, decurrent, cordate-triangular, more or less long-acuminate, strongly costate, papillate on the lower face or on both; paraphyllia numerous and multiform; branch-leaves smaller, ovate-lanceolate, concave, imbricate; areolation small, round-hexagonal, sometimes long-linear at

base and quadrate on the borders. Flowers monœcious or diœcious; perichætium long, imbricate. Calyptra covering the capsule to the middle or lower. Capsule long-pedicellate, narrowly ovate or cylindrical, incurved or arcuate. Operculum conical, or more or less long-rostrate. — *Thuidium*, Schimp.

* *Plants minute, doubly pinnate: areolation round-hexagonal and uniform: capsule horizontal; lid subulate-rostrate: flowers monœcious.*

6. **H. minutulum**, Hedw. Stem papillose-tomentose, irregularly divided; branches pinnately ramulose: stem-leaves more distant, deltoid, acuminate or apiculate, opaque, subrevolute on the borders; costa stout, vanishing near the apex; branch-leaves ovate-acuminate, concave, with shorter costa; leaves and paraphyllia very papillose; perichætial leaves thinner, nearly smooth, the inner lanceolate-acuminate, with the long acumen more or less reflexed: capsule ovate-oblong, cernuous or horizontal, on a long smooth pedicel, dark yellow, brown when old; annulus large, compound. — Musc. Frond. iv. 90, t. 34. *Thuidium minutulum*, Bruch & Schimp. Bryol. Eur. t. 481.

Hab. Decaying trunks and roots of trees, in woods.

7. **H. pygmæum**, Sulliv. & Lesq. Plants dirty green; stem bipinnate, papillose; branches and branchlets short, very slender: stem-leaves much larger, distant, broadly deltoid, long and narrowly acuminate, subdecurrent, spreading; branch-leaves ovate-lanceolate, open-erect, opaque, densely papillose and papillose-crenulate on the borders; costa stout, pellucid, vanishing below the apex; paraphyllia very few or none; perichætial leaves nearly smooth, with a long loose areolation, the inner sheathing, all erect, lanceolate, narrowly acuminate, costate, slightly serrulate above: capsule long-pedicellate, oblong, arcuate, unequilateral, broad-mouthed; teeth flexuous, filiform at the apex; segments as long as the teeth; cilia three, short; annulus large. — Mosses of U. States, 67, and Icon. Musc. 153, t. 98. *Thuidium pygmæum*, Bruch & Schimp. Bryol. Eur. *Thuidium*, 6.

Hab. Limestone rocks, in thin close mats, in shaded ravines, Central Ohio; rare.

Distinct from the last in its smaller size, papillose stems, bipinnate ramification, narrower branch-leaves, and the absence of paraphyllia.

* * *Mode of growth as in the preceding: capsule cylindrical; operculum conical or short-rostrate.*

8. **H. scitum,** Beauv. Plants in appressed green or yellowish brown tufts; stems long, prostrate, 2–3-partite, densely pinnately ramulose; branchlets short and slender: stem-leaves broadly deltoid, cordate, acuminate, those of the branches smaller, cordate-ovate, shorter-acuminate, all concave, open-erect; costa pellucid, vanishing above the middle; areolation nearly round, minute; paraphyllia numerous, multiform; inner perichætial leaves long-lanceolate, with a long filiform acumination, plicate lengthwise: capsule cylindrical-oblong, erect or slightly curved; operculum conical-rostrate, curved upward; annulus large. — Prodr. 69; Sulliv. Icon. Musc. 155, t. 99. *Thuidium scitum*, Aust. Musc. Appal. n. 300. *Rauia scita*, Aust. Bull. Torr. Club, vii. 16.

Var. **æstivale.** Inner perichætial leaves less gradually pointed: capsule subhorizontal, obovate, pale; pedicel yellow, obscurely scabrous, as in all the group. — *Thuidium scitum*, var. *æstivale*, Aust. Musc. Appal. n. 301. *T. æstivum*, Aust. Bull. Tor. Club, v. 23.

Hab. Roots and base of trees, mostly the beech; flowering from August to the end of September, according to exposure; not common.

This moss is a *Thuidium* in all its characters. It has been separated by Austin into a new genus, *Rauia*, on account of its more erect capsule, and the cilia in pairs instead of threes. Other allied species, as *H. abietinum*, have sometimes two cilia, which are even short and irregular.

9. **H. erectum.** Stems very slender, covered with paraphyllia; branchlets erect, nearly simple, dirty yellow: leaves densely imbricate, hastate, lanceolate or oval-lanceolate, clasping at base, narrowed to a long pellucid point; costa broad, vanishing below the apex; cells of the areolation very small, rounded, chlorophyllose, papillose; perichætial leaves narrowly lanceolate, very long filiform-acuminate: capsule cylindrical or ovate-cylindrical, erect, brown, on a very slender smooth pedicel; operculum yellow, conical, long-rostrate, incurved; teeth pellucid and tuberculate at base; segments narrow, gradually attenuate, not perforated; basilar membrane narrow; cilia none. — *Thuidium erectum*, Duby, Regensb. Flora, lviii. 284 (1875).

Hab. Florida (*Chapman*, in Herb. Delessert).

Besides the long pellucid point of the leaves, the essential character which separates this species from *H. scitum* is the absence of cilia.

10. **H. gracile,** Bruch & Schimp. Much like *H. scitum*, differing in the stems more diffusely divided, the leaves longer acuminate, dentate-serrate above, the capsule short-necked, turgid, oval-oblong, cernuous or nearly horizontal with a broad orifice, the short conical or mamillate lid, and the segments separated by three long cilia. — Lond. Journ. Bot. ii. 668 (1843); Sulliv. Musc. Allegh. n. 5, and Icon. Musc. 156, t. 100. *H. microphyllum*, Muhl. Cat. *Thuidium gracile*, Bruch & Schimp. l. c. 5; Lindb. Faun. Flor. Fenn. ix. 268.

Var. **Lancastriense,** Sulliv. & Lesq. Leaves shorter, appressed, more distinctly serrate at the apex; perichætium greenish: capsule smaller and narrower; operculum longer. — Musc. Bor.-Amer. Exsicc. n. 278.

Var. **Ravenellii,** Sulliv. & Lesq. l. c., n. 279. Plants smaller, slender: leaves flat on the borders, with dense areolation: pedicel shorter, curved; cilia appendiculate; lid longer.

Hab. On decayed logs in woods; the first variety in less humid situations, on roots of trees in dry hilly regions; the second on stone, brick walls, etc. South Carolina and Florida.

This species is extremely variable according to its location. *H. pallens*, Lindb. Ms. (Schimp. Syn. ed. 2, 611), differs from the normal form of *H. gracile* merely in the narrower and longer-pointed leaves, those of the branchlets more papillose and sharply serrate at the apex. *H. varium*, in Drummond's second collection (n. 140, 141), found near St. Louis, is intermediate between this form and the typical one, and distinct from both in its nearly smooth leaves. *H. Virginianum*, Brid. Bryol. Univ. ii. 576 (Dill. Musc. 282, t. 36, fig. 18. *Thuidium Virginianum*, Lindb. Musc. Scand. 36), is recognized by Lindberg as identical with the var. *Lancastriense.*

11. **H. calyptratum,** Sulliv. Plants very small; stems creeping, filiform, simply pinnate, flagelliform at the apex: leaves open-erect, broadly ovate, narrowly long-acuminate, denticulate to the middle; borders recurved toward the base; costa percurrent: areolation minute, subquadrate: calyptra very long, cuculliform, descending below the base of the capsule, persistent: capsule long-pedicelled, cylindrical, oblique, slightly curved; operculum conical, obtuse; segments cleft between the articulations, separated by single short cilia; annulus none. — Pacif. R. Rep. iv. 190, t. 10.

Hab. Near Los Angeles, California, on the ground (*Bigelow*).

The long calyptra, the absence of the annulus, and the segments cleft and separated by solitary cilia, especially separate this species from the preceding.

* * * *Plants of fine and large growth, creeping, 2–3-pinnately ramulose: capsule long-cylindrical, erect, incurved or arcuate: flowers dicœcious.*

12. **H. tamariscinum,** Hedw. Stems strong and very long, alternately arched and attached to the ground by bundles of rootlets: stem-leaves broadly deltoid, subcordate at the concave subplicate base, abruptly and narrowly lanceolate-acuminate, papillose on both sides, revolute and crenulate on the borders, irregularly serrulate at the apex; branch-leaves ovate-lanceolate, concave, bright green when young, ochreous or reddish brown when old; apical cells simple, oval, projecting; perichætial leaves long-ciliate below, the inner with a long flexuous and flagelliform point; the cilia filiform, simple or branched: capsule on a long dark purple pedicel; operculum uniform in color; annulus none.—Spec. Musc. 261, excl. syn., t. 67. *Thuidium tamariscinum*, Bruch & Schimp. Bryol. Eur. t. 482, and 483. *T. tamariscifolium*, Lindb. Faun. Flor. Fenn. xiv. 415, t. 1, fig. 7.

Hab. Mountain districts, on the ground. Fructifies in winter.

13. **H. recognitum,** Hedw. Plants more slender, more densely and widely cespitose, bipinnately ramulose; branchlets shorter: stem-leaves more densely crowded, more enlarged at base; branch-leaves broadly ovate, concave at base, acuminate, sharply serrulate; apical cells cylindrical, truncate and crowned by two or three acute papillæ; inner perichætial leaves ovate-lanceolate, gradually narrowed into a long filiform serrate loricate point, not ciliate on the borders: capsule smaller; operculum shorter-rostrate; annulus large, distinct, deciduous.—Musc. Frond. iv. 92, t. 35. *Thuidium delicatulum*, Bruch & Schimp. Bryol. Eur. t. 484. *T. recognitum*, Lindb. l. c. 416, t. 1, fig. 9.

Hab. On the ground, roots of trees, rocks, etc.; very common. Fruiting in June.

14. **H. delicatulum,** Linn. Mode of growth, color, ramification, form of the leaves, etc., as in the last. It has also the same kind of apical cells in the branch-leaves, but the perichætial leaves are like those of *H. tamariscinum*, very long-ciliate; the operculum is more slender and long-rostrate, and the annulus is narrower than in *H. recognitum*, but more distinct than in *H. tamariscinum*.—Spec. Pl. 1125, in part (the American plant); Hedw. Musc. Frond. iv. 87, t. 33. *H. proliferum*,

Drumm. Musc. Amer. n. 136. *H. tamariscinum*, Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 272. *Thuidium delicatulum*, Mitt. Journ. Linn. Soc. xii. 578; Lindb. l. c., fig. 8.

HAB. Same as the preceding.

From the observations of Lindberg there has been a confusion of the species of this group. The true *H. tamariscinum* has not been found in North America, or is here very rare, and the specimens distributed under this name in Sulliv. Musc. Allegh. and Sulliv. & Lesq. Musc. Bor.-Am. Exsicc., and in Austin's Musc. Appal. represent mostly *H. delicatulum*, while those distributed as *H. delicatulum* mostly represent *H. recognitum*. If, as it seems, we have only two species, *H. recognitum* and *H. delicatulum*, they are very easily identified by the characters of the perichætial leaves. The character of the apical cells of the branch-leaves, which essentially separates *H. tamariscinum*, has not been remarked by any American bryologist.

* * * * *Stems erect, simply pinnate, ramulose: operculum convex, conical.*

15. **H. abietinum,** Linn. Dicœcious: plants in wide yellowish green tufts; stems simple or bipartite, slightly radiculose, pinnately divided into short nearly equal branches: stem-leaves close, broadly ovate, long-acuminate, deeply sulcate, costate and canaliculate to below the point; borders flat on one side, reflexed on the other; branch-leaves ovate-acuminate, very concave, irregularly denticulate on the borders, all very papillose; paraphyllia crowded, loricate-filiform; inner perichætial leaves long, lanceolate-acuminate, sulcate, entire: capsule narrow, cylindrical, slightly incurved, arcuate when empty, chestnut-colored; operculum conical, acuminate; cilia two or three, unequal and irregular; annulus large, compound. — Spec. Plant. 1126. *Thuidium abietinum*, Bruch & Schimp. Bryol. Eur. t. 485.

HAB. Shaded rocks and barren ground bordering woods; not rare, but fruiting specimens very rarely found; Rocky Mountains of Colorado (*Porter*), in fruit.

16. **H. Blandovii,** Web. & Mohr. Monœcious: tufts bright green; stems long, 2–3-parted, covered with paraphyllia; branches close, distichous, attenuated, flexuous or recurved: stem-leaves large, imbricate, broadly ovate-cordate, acuminate, irregularly plicate lengthwise, reflexed on the borders, papillose on the back, with long ramose basilar cilia; areolation oblong, loose, soft; branch-leaves broadly ovate, short-acuminate, plicate, entire, all costate to below the apex; paraphyllia very long,

laciniate-ciliate; perichætial leaves short-acuminate, denticulate at the apex: capsule oblong-cylindrical, cernuous, arcuate when dry, light brown; lid conical, acute and apiculate; teeth very densely articulate, dark orange; segments nearly entire; cilia three, long, perfect; annulus large, compound. — Bot. Tasch. 332; Schwaegr. Suppl. ii. 1. 158, t. 142. *Thuidium Blandovii*, Bruch & Schimp. Bryol. Eur. t. 486.

Hab. Peat bogs, Wisconsin (*Lapham*); Western New York; Canada (*Macoun*); Fort Colville (*Lyall*).

Species not sufficiently known.

17. **H. remotifolium,** Grev. Monœcious: plants irregularly bipinnate: stem-leaves large, lanceolate-acuminate, crispate; borders revolute, undulate: capsule short-pedicelled, erect, narrowly long-cylindrical, ascending; annulus present. — Edinb. Mem. Wern. Soc. v. 483; Muell. Syn. ii. 490.

Hab. Western America.

Mueller remarks on this species that the figure in Schwaegr. Suppl. ii. 2. 170, t. 200, given from Hooker's specimens received from Montagne, scarcely represents the species. Its true characters are not known and its affinities are uncertain. Mueller had seen only an imperfect peristome of the species.

18. **H. Alleni.** Stems erect or compressed with fasciculate innovations, bipinnately branching, densely paraphyllose: leaves broadly ovate, concave, very shortly acuminate or acute, plane or subsulcate, minutely papillose, crenulate on the borders, auriculate and subdecurrent at base; costa strong, ascending nearly to the apex; areolation minute, distinct, unipapillose; paraphyllia long, simple or sparingly divided, geniculate; branch-leaves short, lax, flexuous, without paraphyllia and with more slender shorter costa, etc. — *Thuidium Alleni*, Aust. Bull. Torr. Club, vii. 16.

Hab. In a peat swamp near New Haven, Conn. (*John Allen*).

Subgenus IV. CLAOPODIUM.

Plants small; stems prostrate or creeping, increasing by stolons or lateral branches, divaricate, irregularly bipinnately ramulose; branches short and simple, or longer and attenuate, flagelliform. Leaves open, erect, lanceolate-acuminate from an ovate subcordate base, denticulate all around, papillose on the

back; areolation small, oval or fusiform-angular; paraphyllia none. Flowers diœcious. Capsule short-oval, turgid, abruptly curved downward at the base of the inflated collum. Pedicel smooth or rough. Operculum conical, constricted into a short point. Teeth closely articulate; segments split between the articulations; cilia two or three, long.

Related to *Thuidium* in the papillose areolation and the form of the leaves; to *Eurhynchium* in the absence of paraphyllia and the character of the peristome; differing from both in the form of the capsule and lid.

19. **H. leuconeurum,** Sulliv. & Lesq. Plants yellowish green, glossy; stems slender; branches short, appressed: leaves open, erect, costate to the apex; the perichætial ovate-lanceolate, long filiform-acuminate, ecostate; areolation minute, scarcely longer toward the base: capsule ovate, horizontal; pedicel curved, smooth; operculum long-conical, apiculate or short-rostellate; segments punctulate; intermediate cilia three, not half as long as the segments; annulus large. — Musc. Bor.-Amer. Exsicc. (ed. 2), n. 407[b]; Sulliv. Icon. Musc. 102, t. 80. *Thuidium leuconeurum*, Lesq. Mem. Calif. Acad. i. 31.

Hab. On trunks of *Quercus agrifolia* and on moist soil of shaded hills; Oakland, California (*Bolander*); Cœur d'Alene Mountains, N. W. Montana (*Watson*).

20. **H. Whippleanum,** Sulliv. Plants small, dirty green, prostrate; stems irregularly divided; primary branches long, flexuous, pinnately ramulose, attenuate, flagelliform, radiculose at the apex: leaves erect-spreading, those of the stem deltoid, cordate at base, those of the branches narrower, all long-acuminate, dentate, serrate all around, costate to the apex; areolation minutely quadrate-oblong; perichætial leaves ovate, gradually narrowed into a slender flexuous point, costate to below the point: capsule abruptly inclined from a short neck, ovate, on a tuberculose flexuous pedicel; operculum conical, constricted in the middle, apiculate; segments splitting, separated by two cilia as long as the segments. — Pacif. R. Rep. iv. 190, t. 9.

Hab. Coast ranges near San Francisco (*Bigelow*).

The species is closely allied to *H. leuconeurum*, differing essentially in the rough pedicel, the absence of annulus, and the cilia, which are only two and of twice the length.

21. **H. ramulosum,** Hampe. Stem thickish, simply pinnate; branches short, unequal, bright green: stem-leaves densely

crowded, erect-spreading, soft, broadly cordate, subdecurrent-auriculate at base, abruptly narrowed into a crenulate hyaline piliferous point; costa whitish, vanishing below the apex; areolation of minute rounded slightly papillose cells; perichætial leaves broadly ovate, erose-dentate, long and narrowly acuminate, denticulate, narrowly costate, loosely reticulate: capsule small, horizontal, turgid, oblong, pale, on a short rough purplish pedicel; operculum conical, obliquely rostellate; segments yellowish, split; cilia two; annulus large. — Muell. Syn. ii. 486.

Hab. Cape Disappointment, Washington Territory.

22. **H. crispifolium,** Hook. Stems pinnately and bipinnately much divided, dirty yellow: leaves densely imbricate, yellowish green, opaque, subfalcate-secund; those of the stems deltoid-ovate, attenuate into a long crispate point, undulate-rugose, soft, thickish, decurrent at base, minutely areolate, strongly nerved; branch-leaves narrower, ovate-lanceolate; the perichætial erect, lanceolate, gradually narrowed to a long flexuous point, ecostate, serrulate: capsule oval-oblong, horizontal; pedicel purplish, rough; peristome of *Eurhynchium.* — Musc. Exot. t. 31.

Hab. Shaded ground and rocks, Northwestern America (*Menzies*); Vancouver Island (*Wood*); California (*Bolander, Watson*); Fort Colville (*Watson*).

23. **H. laxifolium,** Schwaegr. Stems long, creeping, prostrate and rigid; branches and branchlets bright green: stem-leaves loosely imbricate, open-erect, deltoid, ovate and decurrent at base, acuminate, serrate or denticulate; branch-leaves narrower; costa vanishing in the apex; perichætial leaves oblong, sheathing, erect, long flexuous-acuminate, denticulate at the apex, ecostate: capsule globose-ovate, horizontal on a short red tubercular pedicel; operculum conical, acuminate; peristome as in the preceding. — Suppl. ii. 1. 159, t. 143; Brid. Bryol. Univ. ii. 464. *Leskea laxifolia,* Hook. Musc. Exot. t. 30. *Isothecium laxifolium,* Brid. l. c. 359.

Hab. Northwest coast of America (*Menzies*).

Subgenus V. ELODIUM.

Stems villous, ascending, 2–3-parted, distantly and pinnately ramulose; branches subcompressed. Leaves lanceolate-acuminate, striate, not papillose; areolation elongated, rhomboidal;

costa subpercurrent. Capsule cernuous. Operculum convex-conical.

24. **H. paludosum,** Sulliv. Monœcious: plants yellowish green; branchlets distichous, slender, unequal: leaves open-erect, cordate-concave at base, lanceolate, acuminate, reflexed on the borders, strongly costate to the denticulate apex, smooth on both faces; paraphyllia ciliate, numerous; inner perichætial leaves oblong, gradually narrowed into a short slender point, plicate-striate lengthwise: capsule oblong-cylindrical, thicker above, cernuous; operculum conical, apiculate, short; segments cleft between the articulations; cilia three, as long as the segments; annulus large. — Musc. Allegh. n. 7, Mosses of U. States, 68, and Icon. Musc. 157, t. 101.

Hab. Not rare in the cranberry marshes of Northern Ohio; Rhode Island (*Olney*); Massachusetts (*Russell*); Vermont (*Frost*), etc.

This species so much resembles *H. Blandovii* that it has sometimes been confounded with it. It differs in the paraphyllia less densely crowded upon the stems, the leaves not papillose and not fringed at the basal margin, the segments cleft, etc.

Subgenus VI. TRIPTEROCLADIUM.

Plants loosely cespitose, intricate; stems compressed; branches compressed or subterete, attenuated, irregularly pinnate. Leaves erect, more or less open, very smooth; cells of the areolation elliptical, the alar quadrate-rhomboidal. Capsule erect, cylindrical, cernuous. Operculum conical. Flowers monœcious.

25. **H. leucocladulum,** Muell. Stems long, very slender, filiform; lower branchlets shorter, brown by maceration, the upper long, attenuate-filiform, subjulaceous: stem-leaves close, erect or open, small, exactly ovate from the decurrent base, obsoletely denticulate at the apex; those of the branches oblong and narrower, all very short, bicostate, concave, revolute at the base, pale green; inner perichætial leaves numerous, large, sheathing at the broader base, short-acuminate, reflexed, the upper all very slightly denticulate: calyptra glabrous: capsule erect, small, cylindrical-oval, on a short very slender reddish flexuous pedicel, slightly cernuous, reddish, glossy; operculum small, conical, acute; annulus narrow; teeth distinctly latticed;

segments yellow, attached to a fragile scarious membrane, narrowly lanceolate, split or disjointed, separated by solitary delicate subnodose cilia. — Regensb. Flora, lviii. 79 (1875).

HAB. Oakland, Oregon (*Harvy*).

26. **H. compressulum,** Muell. l. c. Plants slender, bright green, soft; stems short, slender, distinctly compressed; branchlets short, very slender, irregularly pinnate, slightly compressed: stem-leaves erect, more or less open, ovate or oblong-acuminate, concave, slightly decurrent at base, distinctly denticulate all around, bicostate; cells soft, very glossy; upper perichætial leaves longer acuminate: capsule much longer, very narrowly cylindrical.

HAB. Oakland, Oregon (*R. D. Nevius*).

SUBGENUS VII. CAMPTOTHECIUM.

Plants yellow, glossy, cespitose; stems pinnately ramulose. Leaves crowded, erect, strict, subscarious, long-lanceolate, gradually acuminate, deeply plicate lengthwise, narrowly costate; areolation very narrow, linear or vermicular, smooth, the basal cells quadrate at the angles. Flowers diœcious; male buds often parasite upon female plants. Capsule oblong or cylindrical, cernuous, arcuate when dry. Pedicel rough, except in *H. nitens*. Peristome perfect; membrane broad; segments as long as the teeth. — *Camptothecium*, Schimp.

27. **H. lutescens,** Huds. Stems rigid: leaves minutely serrate at the apex, those of the branches narrower and sometimes subsecund: capsule cernuous from above its erect collum, oblong-cylindrical, more or less arcuate, dirty yellow; operculum rostrate. — Flor. Angl. 42; Hedw. Musc. Frond. iv. 40, t. 16. *Camptothecium lutescens*, Bruch & Schimp. Bryol. Eur. t. 558.

HAB. Alaska (*Kellogg*); Northwest coast (*Douglas*); Vancouver Island (*Lyall*); Victoria, Oregon (*Bolander, Nevius*); California (*Coulter*).

28. **H. æneum,** Mitt. Leaves gradually lanceolate-acuminate from the ovate base; costa vanishing below the apex; borders reflexed, distantly serrulate; alar cells small, short, obscure; perichætial leaves long, erect, broadly lanceolate, abruptly acuminate-subulate, serrulate, ecostate: capsule in-

clined, curved; segments cleft between the articulations; cilia three, as long as the segments; membrane large, as in the last species. — Journ. Linn. Soc. viii. 31, t. 5.

Hab. Pend d'Oreille River, N. Idaho (*Lyall*); Fort Colville (*Watson*).

From the author's remarks this species has the same appearance as the last, from which it is distinguished by the apical leaves of the lateral branches having their points broad, somewhat acutate, and obtuse. The peristome is more complete, the segments being separated by three long cilia.

29. **H. Nuttallii**, Wils. Widely cespitose, yellowish brown; stems prostrate, radiculose; branchlets crowded, spreading or homomallous: leaves closely imbricate, narrowly oblong-lanceolate, gradually acuminate, plicate-striate, coarsely dentate at the recurved base, serrate above; costa vanishing in the apex; inner perichætial leaves erect, long-lanceolate, narrowed into a filiform point, striate: capsule long-cylindrical, suberect and subarcuate, with a short distinct neck; pedicel very short and rough, scarcely as long as the capsule; operculum conical, short-rostrate; segments split their whole length; cilia very short, rudimentary; annulus narrow. — Bryol. Brit. 334, 339; Sulliv. Icon. Musc. 211, t. 128. *Camptothecium Nuttallii*, Bruch & Schimp. Bryol. Eur. *Camptothecium*, 6. *Leskea Californica*, Hampe, Linnæa, xxx. 460 (1860).

Hab. On trees, Western coast of North America (*Menzies*); California, Oregon, etc. (*Bolander*, *Bauer*, *Nuttall*, *Bigelow*, etc.); N. Idaho (*Watson*); not common.

Easily recognized from its congeners by its long thick capsule, short pedicel, shorter rostrate operculum, the densely pinnate ramification, and the dentate base of the leaves.

30. **H. Nevadense**, Lesq. Plants robust, loosely cespitose, yellowish green; stems creeping; branchlets short and horizontal, or longer, irregularly divided and arcuate: leaves secund, lanceolate, gradually short-acuminate, minutely serrate at the apex, carinate by the costa, deeply biplicate; borders revolute or recurved; alar cells very few, irregularly quadrate: capsule erect or subcernuous, cylindrical-ovate, on a short reddish pedicel; operculum long-rostrate; cilia very short and rudimentary or none; annulus compound. — Mem. Calif. Acad. i. 33.

Hab. On rocks in the spray of Nevada and Bridal Veil Falls, Yosemite Valley (*Bolander*); Spokan Falls (*Watson*).

Distinguished from *H. lutescens* by its yellowish green color, the large thick stems and branches, its distinctly pinnate ramification, the alar

areolation scarcely marked by a few oval cells, the large capsule, the inner peristome without cilia, etc. The leaves are more regularly and deeply plicate than in any other species of the subgenus.

31. **H. pinnatifidum,** Sulliv. & Lesq. Plants soft, widely and loosely cespitose, bright or pale green; stems slender, prostrate, brittle, densely pinnately ramulose, rootless; branchlets short and flexuous, or longer and flagelliform: leaves open-erect, densely imbricate, lanceolate, gradually subulate-acuminate, plicate, revolute or reflexed on the borders, slightly denticulate at the apex; costa thick, ascending to above the middle; cells of the areolation linear-rhomboidal, the alar quadrate and minute; perichætial leaves imbricate at the sheathing oblong base, gradually long-acuminate, ecostate: capsule thick, oblong or obovate, incurved on a short flexuous rough pedicel; operculum large, highly conical, constricted in the middle, mamillate; peristome normal; annulus large. — Musc. Bor.-Amer. Exsicc. (ed. 2), n. 513; Lesq. Mem. Calif. Acad. i. 33; Sulliv. Icon. Musc. Suppl. 101, t. 77.

Hab. Shaded rocks in cañons, California (*Bolander*).

32. **H. arenarium,** Lesq. Widely and loosely cespitose, dirty yellow, irregularly branching; stems slender; branchlets short and erect, or longer and filiform, attenuated, radiculose: leaves erect, imbricate, lanceolate-acuminate, striate, serrulate, reflexed on the margins; costa stout, vanishing below the apex; cells of the areolation narrow, small, numerous, scarcely distinct, the basilar round-ovate, covering the whole base of the leaves; outer perichætial leaves broadly ovate, short, with a reflexed point, the upper sheathing, abruptly narrowed into a filiform serrulate erect or reflexed point, coarsely dentate below it: capsule small, cylindrical-ovate, cernuous; pedicel long and slender, rough toward the base, nearly smooth above; operculum large, obtusely conical, apiculate; segments perforated; cilia one or two, short; annulus compound, large, persistent. — Trans. Amer. Phil. Soc. xiii. 13.

Hab. Covering sand around bushes near San Francisco, California (*Bolander*).

Easily distinguished from the following by its slender form, the short curved capsule, etc.

33. **H. nitens,** Schreb. Densely cespitose, bright or dirty green, glossy; stems erect, radiculose at the base of the leaves: leaves erect-spreading, strict, long-lanceolate, subulate-acumi-

nate; costa long and slender; inner perichætial leaves very long, filiform-acuminate: capsule cylindrical-oblong, more or less arcuate; pedicel smooth; peristome normal, the teeth yellow; annulus compound. — Spicil. Fl. Lips. 92; Bryol. Eur. t. 622. *Camptothecium nitens*, Schimp. Syn. 530.

Hab. Peat bogs and prairie swamps, in the northern districts; rarely found in fruit. A variety with stems and branches more slender and of a different aspect has been sent from New York by *E. C. Howe*, but excepting the attenuation of all the parts, the characters are identical. The relation of the species to the group is not definite.

34. **H. megaptilum,** Sulliv. Ms. Plants highly cespitose, whitish or pale green, glossy; stems robust, erect, pinnately branching, rootless; branches short, horizontal, distichous, the upper turgid: leaves crowded, erect, imbricate, narrowly ovate above the subdecurrent base, lanceolate, short-apiculate, very plicate, concave, costate to the middle, subrevolute on the borders, denticulate all around and on the back upon the costa and the keels of the folds; cells of the areolation long, narrow, linear, chlorophyllose, the alar few and irregular: flowers pseudomonœcious; male buds radiculose, attached in the folds of the leaves: capsule ovate-oblong, slightly curved, much arcuate and constricted under the orifice when empty; pedicel thick, short, scabrous, dark red; operculum conical, apiculate, constricted in the middle; segments carinate, entire, with two intermediate appendiculate cilia as long as the teeth. — *Camptothecium* (?) *megaptilum*, Sulliv. Icon. Musc. Suppl. 102, t. 78.

Hab. On the ground in deep coniferous woods; Oregon (*E. Hall*).

Subgenus VIII. BRACHYTHECIUM. (Pl. 5.)

Plants generally large, loosely cespitose, prostrate or creeping, irregularly branching, subpinnately ramulose, neither paraphyllate nor tomentose, densely foliate. Leaves broadly ovate and oblong-lanceolate, long-acuminate or narrowed into a filiform point, minutely serrate, irregularly plicate lengthwise, cordate and more or less decurrent at base, not glossy; areolation elongated rhomboidal, the alar quadrate, somewhat chlorophyllose or with the primordial utricle distinct. Capsule horizontal or cernuous (suberect in *H. acuminatum*), thick, turgid-ovate or oblong, incurved. Pedicel smooth or rough. Operculum large,

convex-conical, acuminate. Peristome large; teeth very densely articulate; segments as long as the teeth; cilia two or three. Spores chestnut-color. — *Brachythecium*, Schimp.

* *Pedicel smooth.*

35. **H. lætum**, Brid. Dicœcious: tufts bright or yellowish green; stems prostrate; branches and branchlets unequal, attenuate at the apex, erect: leaves close, ovate-lanceolate, short-acuminate, concave, more or less plicate, narrowly costate to the middle, minutely serrulate all around; cells very long and narrow; perichætial leaves numerous, soft, the inner oblong, abruptly filiform-acuminate, flexuous: capsule suberect or cernuous, narrowly cylindrical-oblong, slightly incurved or subarcuate when dry; operculum narrowly conical; cilia strongly articulate or subappendiculate; annulus none. — Bryol. Univ. ii. 479; Sulliv. Icon. Musc. 185, t. 115. *Brachythecium lætum*, Bruch & Schimp. Bryol. Eur. t. 554.

Var. **dentatum.** Leaves shorter, broader, with a shorter point, more strongly dentate on the borders and more loosely areolate. — *H. salebrosum*, Sulliv. Musc. Allegh. n. 43. *B. Sullivantii*, Bruch & Schimp. Bryol. Eur. *Brachythecium*, 21.

Hab. Woods, on prostrate trunks, shaded ground, or roots of trees; very frequent, and variable according as the locality is more or less damp.

After the description of this species Schimper remarks that we have in North America two or three other species closely related to *Brachythecium lætum*, but which cannot be separated without careful examination. On repeated comparison of a large number of specimens of this polymorphous species, in collaboration with Sullivant, we have found a difference between *H. lætum* of America and that of Europe, this last agreeing with the description of *B. luteolum* of Mueller. But so numerous are the American varieties of this moss that, if only local differences were considered, a number of species could be established, but evidently with only transient characters, like the length of the leaves, the more or less loose areolation, the erect or curved capsule, etc., and even the sometimes pseudo-monœcious inflorescence, differences often to be noticed upon the same plant. We have therefore admitted a single species, *H. lætum*, as described above, and figured in the *Icones* from specimens in the herbarium of Dr. Torrey labelled "*H.* 20, Coll. Dewey," to which Bridel refers as the materials on which he established the species. Comparing the figures of the *Icones* with those of *Bryol. Eur.*, the only important differences to be noticed are that in the American form the capsule is generally larger and the upper perichætial leaves more abruptly narrowed into flexuous filiform points.

36. **H. acuminatum,** Beauv. Dicœcious: plants widely and more or less densely cespitose, dark green passing to glossy yellow; stems radiculose, prostrate; branches distantly ramulose; branchlets two-ranked, unequal, acute, plumose or subjulaceous: leaves close, erect-open, ovate-acute or ovate-lanceolate, acuminate, concave, the borders recurved toward the base, subserrulate from the middle upward, not or only slightly striate; costa vanishing above the middle or below the apex; angular cells granulose; inner perichætial leaves tapering into a long filiform curved acumen: capsule cylindrical-oblong, erect, equal, rarely subincurved, short-pedicelled; operculum long, conical-apiculate; segments punctate; cilia rudimentary; annulus none. — Prodr. 60; Muell. Syn. ii. 334; Sulliv. Icon. Musc. 187, t. 116. *Leskea acuminata*, Hedw. Spec. Musc. 224, t. 56. *L. Beyrichii*, Hampe, Linnæa, xiii. 47, and Icon. Musc. t. 7.

Var. **rupincolum,** Sulliv. & Lesq. Branches julaceous: leaves densely imbricate, short, carinate and more plicate: capsule shorter oblong. — Musc. Bor.-Amer. Exsicc. n. 330[b]. *Leskea rupincola*, Hedw. l. c. 227, t. 54.

Var. **setosum,** Sulliv. & Lesq. l. c., n. 330[c]. Branchlets slender, plumose, pale yellow: leaves longer with looser areolation, the perichætial longer-acuminate: lid long-acuminate, not apiculate. — *Leskea setosa*, Hedw. l. c. 226, t. 57.

Hab. Decayed trunks in woods; the first variety on the ground or on rocks, the last on less shaded trunks. Ranging from Florida to Canada.

A most variable species, but easily recognized by its characters, especially by its straight capsule, and the peristome without cilia.

37. **H. salebrosum,** Hoffm. Monœcious: plants widely cespitose, glossy, whitish or yellowish green; stems subpinnately ramulose: leaves close, erect, open, loosely imbricate when dry, ovate-lanceolate, acute or filiform-acuminate, irregularly sulcate; borders entire or subserrulate; costa reaching the middle or beyond, sometimes forking: capsule short, cernuous, ovate or ovate-oblong, incurved; pedicel very smooth; operculum conical; intermediate cilia two, slightly shorter than the segments, articulate; annulus narrow. — Deutschl. Fl. ii. 74. *H. plumosum*, Huds. Fl. Angl. 423; Brid. Bryol. Univ. ii. 475; Muell. Syn. ii. 358. *Brachythecium salebrosum*, Bruch & Schimp. Bryol. Eur. t. 549, 550.

Var. **longisetum.** Stems long, ascending, sparingly ramulose: leaves shorter and shorter-acuminate, indistinctly serrate. — Bruch & Schimp. l. c., as *Brachythecium.*

Var. **palustre.** Stems tall, stout: leaves broader, more concave, scarcely plicate, with a shorter point. — *H. Mildeanum*, Schimp. Syn. 694.

Var. **cylindricum.** Stems appressed, pinnately ramulose: leaves shorter, very glossy, pale: capsule erect, longer, subarcuate. — Bruch & Schimp. l. c.

Var. **Texanum.** Stem-leaves abruptly subulate-acuminate, the lower entire, the upper serrate: capsule oblong-cylindrical; pedicel thicker, pale-colored. — Aust. Bull. Torr. Club, vi. 44, as *Brachythecium.*

HAB. Moist ground, decaying trunks of trees, stones, etc., in the woods; the first variety in more arid places; the second in swampy ground; the next in South Carolina (*Ravenel*); the last in Texas (*Boll*).

38. **H. acutum,** Mitt. Monœcious: plants loosely cespitose, bright glossy green: stems long, flexuous, creeping, radiculose at base, sparingly branching; branchlets short, very open, often reflexed: leaves loose, open-spreading when moistened, lanceolate, gradually long-pointed, distantly and obscurely serrulate all around, subdecurrent and short-auriculate at base, costate to above the middle; basal cells loose, subquadrate; perichætial leaves narrowly subulate, recurved from a short oval erect base, nerved: capsule oval, subinclined and subcernuous and unequal; pedicel long; operculum long-conical, apiculate or subulate; teeth hyaline-bordered; cilia two, appendiculate. — Journ. Linn. Soc. viii. 32, t. 6. *Brachythecium acutum*, Sulliv. Icon. Musc. Suppl. 99, t. 75.

HAB. Pack River, British Columbia (*Lyall*); Massachusetts (*Greene*).

Closely resembling *H. salebrosum*, but differing from this and other allied species in the leaves gradually narrowed from just above the base, not narrowed and acuminate above, in the longer operculum, the teeth bordered by a pellucid margin, and the appendiculate cilia. The species is referred by Lindberg (Musc. Scand. 35) to *H. Mildeanum*, Schimp.

39. **H. albicans,** Neck. Dicœcious: irregularly cespitose; tufts loose, soft, whitish green; stems with few simple or sparingly ramulose branches, terete: leaves close, more or less densely imbricate, ovate-lanceolate, with a short subpiliform point, sulcate, costate to the middle, entire or subserrulate at

the apex; perichætial leaves narrowed into a long filiform point: capsule small, ovate, turgid, horizontal or inclined, subcernuous, brown, becoming black when old; peristome normal; annulus narrow. — Meth. Musc. 180; Muell. Syn. ii. 360. *Brachythecium albicans*, Bruch & Schimp. Bryol Eur. t. 553.

Hab. Grassy sandy ground in mountains; Rocky Mountains (*Bourgeau*); Uinta Mountains, and Cœur d'Alene Lake, N. Idaho (*Watson*).

40. **H. biventrosum,** Muell. Dicœcious: plants small, loosely cespitose, bright green; branches very short, slender, curved: stem-leaves close, erect, open, small, scarcely decurrent at base, ovate-acuminate, not plicate, but ventricose at base on both sides of the costa, recurved on the borders at the base only, denticulate all around, costate to the middle; alar cells very small, chlorophyllose; inner perichætial leaves sheathing at base, more or less abruptly narrowed into a filiform reflexed point, ecostate: capsule small, cylindrical-oblong, not curved; lid conical, very shortly apiculate; teeth narrow; segments split; cilia rudimentary. — Bull. Torr. Club, v. 49, and Regensb. Flora, lviii. 90. *Brachythecium splendens*, Aust., Coult. Bot. Gaz. ii. 111.

Hab. Deep woods near Baton Rouge, Louisiana (*Joor*); on Palmetto trunks, St. Augustine, Florida (*J. Donnell Smith*).

In aspect like small forms of *H. lætum.*

41. **H. Thedenii,** Hartm. Dicœcious: plants slender, loosely cespitose; stems very long, creeping, pinnately ramulose: leaves loose, erect, open, homomallous or falcate-secund, long, filiform-acuminate from an ovate-lanceolate base, obliquely uncinate, flexuous above when dry, serrulate all around, plicate, narrowly costate to below the apex; inner perichætial leaves very long, filiform-acuminate, serrate: capsule abruptly horizontal, short-ovate, turgid; operculum convex-conical, apiculate; peristome large; teeth coarsely articulate above; segments and cilia (2) as long as the teeth, the latter marked with prominent articulations; annulus simple. — Skand. Fl. ed. 9, 11. *Brachythecium Thedenii*, Bruch & Schimp. Bryol. Eur. t. 551. *H. albicans*, var. *Thedenii*, Hartm. l. c., ed. 10, 15.

Hab. Erroll Dam, Androscoggin River, New Hampshire (*James*).

42. **H. Donnellii,** Aust. Monœcious: plants small, compressed, cespitose, bright or yellowish green, shining; stems slender, creeping, flexuous, with short thick simple branches:

leaves ovate-lanceolate, narrowly acuminate, striate, very entire or rarely distantly serrulate at the apex, slightly falcate, loosely imbricate; costa narrow, enlarged at the base, vanishing in the middle; cells of the areolation large, the upper fusiform-acute, the basilar numerous, quadrate; perichætial leaves small, nearly similar, ecostate: capsule short-pedicelled, very small, oval, subhorizontal; operculum conical, depressed; inner peristome short; segments subentire; cilia imperfect or none. — Coult. Bot. Gaz. iv. 162.

Hab. Rotten wood, roots of trees and shells on the shell mound of Charlotte Harbor (Pine Island), Florida (*J. Donnell Smith, Austin*). March.

The simple short creeping stems, and the small subhorizontal capsule are peculiar characters which easily separate this species from all the others of the group. At first sight it resembles *H. microcarpum*, Muell., but the operculum of this last species is long rostrate-subulate, and the leaves are ecostate. The basilar quadrate areolation of the leaves is also peculiar.

43. **H. collinum,** Schleich. Monœcious: plants small, in dense hemispherical bright green tufts; stems creeping, densely radiculose, ramulose; branchlets short: leaves close, imbricate or subsecund, lanceolate-acuminate from a broadly ovate deeply cordate base, concave, serrulate on the borders, costate to the middle; basilar cells larger, chlorophyllose, the upper hyaline; perichætial leaves abruptly narrowed into a short narrow point, ecostate: operculum highly convex, obtusely acuminate; peristome normal; annulus compound. — Muell. Syn. ii. 429. *Brachythecium collinum*, Bruch & Schimp. Bryol. Eur. t. 548.

Hab. Fissures of rocks on high mountains; Rocky Mountains (*Drummond*); Colorado (*Downie*); Nevada (*Watson*); Cascade Mountains (*Lyall*).

44. **H. Utahense.** Synœcious: resembling the last, from which it differs in its inflorescence, its smaller size, more delicate texture, the oblong-lanceolate leaves, and the erect and symmetrical capsule. — *Brachythecium Utahense*, James, Bot. King Exp. 409.

Hab. On sandstone rocks, overhanging dry streamlets near Hanging Rock Station, Echo Cañon, Utah (*Watson*); Bald Mountain, Western Montana (*Watson*).

* * *Pedicel rough.*

45. **H. velutinum,** Linn. Monœcious: plants in intricate drooping tufts, bright or yellowish green; stems creeping,

irregularly pinnately ramulose; branchlets curved at the apex: leaves subfalcate-secund, ovate-lanceolate, acuminate, serrulate, costate to above the middle, loosely areolate with few quadrate-oblong alar cells; perichætial leaves gradually narrowed into a long point, costate: capsule cernuous and horizontal, turgid or gibbous-ovate, constricted under the orifice when dry; pedicel purple, tuberculate; lid large, convex-conical, apiculate; segments perforated, and cilia as long as the teeth; annulus revoluble. — Spec. Pl. 1129; Hedw. Musc. Frond. iv. 70, t. 27. *Brachythecium velutinum*, Bruch & Schimp. Bryol. Eur. t. 538. *H. declivum*, Mitt., Journ. Linn. Soc. viii. 33, t. 6.

Hab. Mountain regions, on soft loose earth in shady places; mountains of New York, Vermont, etc.; Pend d'Oreille River, N. Idaho (*Lyall*); not common.

A very variable species; plants slender or robust; stems more or less divided, and the branchlets varying in length; leaves close or more distant, bright green or yellow, opaque or glossy; capsule subglobose or oblong, on a short or long pedicel, etc. According to Mitten, *H. declivum* differs from the normal forms merely in the thicker more scabrous pedicel and the capsule pendulous when old, characters which in such polymorphous species cannot be considered as specific.

46. **H. Hillebrandi,** Lesq. Monœcious: plants small, in dense intricate glossy yellowish tufts; stems prostrate, irregularly pinnately ramulose; branches short, radiculose: leaves imbricate, erect, rarely subsecund, ovate-lanceolate, acuminate, concave, costate to the middle, flat or slightly reflexed on the borders, serrulate all around; alar cells numerous, small, quadrate; perichætial leaves oblong at base, gradually short-acuminate, pellucid, ecostate and nearly entire: capsule small, erect, turgid at base, obovate, nearly equal, rarely inclined, constricted under the broad orifice when empty; pedicel short, 1 c.m. long, reddish and rough at base, yellowish and smooth above; operculum short-conical, obtuse, apiculate; peristome normal; segments and cilia as long as the teeth; annulus simple. — Mem. Calif. Acad. i. 33. *Brachythecium Hillebrandi*, Sulliv. Icon. Musc. Suppl. 98, t. 74.

Hab. On rocks, Merced River, California (*Bolander*).

47. **H. Fendleri,** Sulliv. & Lesq. Monœcious and more generally synœcious: plants small, densely entangled, cespitose, pale green, glossy; stems prostrate, radiculose, closely ramulose; branchlets very short, terete-foliate: leaves erect, ovate or elliptical-lanceolate, narrowed into a somewhat long narrow

point, concave, serrulate and recurved on the borders, costate to above the middle; cells very narrowly linear, enlarged at the angles; inner perichætial leaves oblong, abruptly long-acuminate; costa almost none: capsule oblong, regular and suberect, or slightly inclined and more convex on one side, on a purple pedicel rough at the base only; lid large, obtusely long-conical, constricted in the middle, mamillate; teeth densely articulate, hyaline-marginate; segments large; cilia solitary and short or none; annulus double, revoluble. — Musc. Bor.-Amer. Exsicc. n. 334; Sulliv. Mosses of U. States, 76, and Icon. Musc. 189, t. 117. *Leskea Fendleri*, Sulliv. Mem. Amer. Acad. iv. 169, t. 1. *H. velutinum*, var. *microcarpum*, Muell. Syn. ii. 400.

Hab. On rocks near Santa Fe, New Mexico (*Fendler*).

Resembles the last in size and habit, but is easily recognized by its longer capsule and longer operculum; the basilar cells are few and large in this species, and the peristome is of a different character.

48. **H. Bolanderi,** Lesq. Dicœcious: tufts compact or loose and widely expanded, pale green; stems irregularly divided; branches long, flexuous or rigid, suberect, subpinnately ramulose: leaves open-erect, ovate-lanceolate, short-acuminate, flat on the borders, serrulate all around, costate to above the middle; areolation loose, the alar cells few, distinct, oblong-quadrate, pellucid; upper perichætial leaves broadly sheathing at base, narrowed into a flexuous or reflexed serrulate long point, obsoletely costate: capsule short-oval, gibbous, horizontal; operculum short-conical, brown, tipped with black; pedicel short, blood-red, arcuate above, rough; segments split their whole length; cilia two, as long as the segments; annulus large, compound, revoluble. — Trans. Amer. Phil. Soc. xiii. 12; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. (ed. 2), n. 502.

Hab. On the ground, under *Umbellularia Californica* (*Bolander*).

With the aspect of *H. Sullivantii*, but distinguished at once by its short-conical operculum.

49. **H. Starkii,** Brid. Monœcious: more or less densely tufted; stems prostrate, branching; branchlets erect, arcuate at the apex: stem-leaves obcordate, lanceolate-acuminate, half-twisted at the point, those of the branches narrower, all decurrent at the basilar concave angles, serrate, costate to below the point, bright green and glossy; meshes of the areolation loose, hexagonal-rhomboidal, the alar large, quadrate; perichætial leaves squarrose, the inner ecostate, pale: capsule abruptly

horizontal, short-ovate, turgid, solid, black when old, polished and subglobose when empty; lid convex-conical; segments split open; cilia appendiculate; annulus large. — Musc. Recent. ii. 2. 107. *Brachythecium Starkii*, Bruch & Schimp. Bryol. Eur. t. 541.

Hab. Mountains of New England (*Oakes*); Pennsylvania (*James*).

Variable in its more or less robust character and longer subcreeping pinnately ramulose stems. In its slender state the species resembles the next. It is generally of a darker green color.

50. **H. reflexum,** Starke. Monœcious: entwining, widely cespitose, flat, pale or yellowish green; stems slender, long-procumbent, more or less pinnately ramulose; branches and branchlets curved: stem-leaves more distant, spreading, subsecund on the branchlets, broadly ovate, more or less abruptly subfiliform-acuminate, decurrent at base, minutely serrate all around; costa subpercurrent; alar cells loosely oval-quadrate; perichætial leaves ecostate: capsule small, ovate-globose, solid, abruptly horizontal; operculum convex-conical, apiculate; segments split nearly their whole length; cilia slender, appendiculate; annulus narrow. — Web. & Mohr, Bot. Tasch. 306 and 476; Schwaegr. Suppl. ii. 1. 161, t. 143. *Brachythecium reflexum*, Bruch & Schimp. l. c., t. 539. *H. subtenue*, James, Proc. Acad. Philad. 1855, 447.

Hab. Gorham, New Hampshire (*James*); Garrett County, Maryland (*J. Donnell Smith*).

51. **H. œdipodium,** Mitt. Monœcious: stems procumbent, loosely cespitose, subpinnately divided; branches radiculose: leaves broadly ovate-acuminate, costate to the middle, serrulate on the borders; cells of the basal angles numerous, quadrate; perichætial leaves convolute, broadly elliptical-acuminate, serrulate at the apex, ecostate: capsule inclined, oval, unsymmetrical; pedicel thick, minutely scabrous; lid conical; peristome normal; cilia two, appendiculate. — Journ. Linn. Soc. viii. 32, t. 5.

Hab. Lake Huron (*Todd*); Pack River and Rocky Mountains (*Lyall*); Bitterroot Mountains, N. W. Montana (*Watson*).

Like *H. Starkii* in the thick seta and appearance of the capsule, but the leaves differ in texture, and in drying do not become striated.

52. **H. rutabulum,** Linn. Monœcious: loosely cespitose, bright or yellowish green, scarcely glossy; stems prostrate, creeping; branches and branchlets erect, gradually attenuate to

the apex: leaves open, broadly ovate-lanceolate, gradually acuminate, narrowed and cordate at base, not inflated at the angles, obscurely plicate, serrate all around, costate to above the middle; areolation loose, rhomboidal, the alar cells large, the basilar oblong or hexagonal; perichætial leaves abruptly narrowed into a filiform point, reflexed from the middle: capsule oblong or ovate, turgid, subarcuate, solid, chestnut-color, brown when old; pedicel long and strong, purple, very rough; operculum large, convex-conical, acuminate; segments split in the middle; cilia as long as the segments, two or three, not appendiculate; annulus double. — Spec. Pl. 1124; Hedw. Musc. Frond. iv. 29, t. 12. *Brachythecium rutabulum*, Bruch & Schimp. Bryol. Eur. t. 543.

Var. **longisetum**, Brid. Stem long, subpinnately ramulose, loosely foliate: capsule oblong, subincurved on a very long slender pedicel.

Var. **flavescens**, Brid. Stems and branches very long, prostrate, flaccid: leaves very broad, more abruptly acuminate, soft, yellowish green.

Var. **plumulosum**. Small, soft, with short branchlets: leaves ovate-lanceolate, narrowly acuminate, glossy. — Bruch & Schimp. l. c., as *Brachythecium*.

Var. **densum**. Branchlets close: leaves crowded, loosely imbricate, dark green: capsule short-pedicellate, thick. — Bruch & Schimp. l. c.

Var. **robustum**. Stems prostrate, long; branches and branchlets stout: leaves close, broader, bright green. — Bruch & Schimp. l. c.

Hab. Common on shaded ground, roots of trees, and stones; plains and mountains; W. Humboldt Mountains, Nevada (*Watson*).

A very variable species, often confounded with *H. salebrosum*, from which it differs in the scarcely plicate, less long-acuminate and less glossy leaves, and the very scabrous pedicel.

53. **H. asperrimum**, Mitt. Closely resembling the last, from which it differs in the dicœcious inflorescence, the stems more rigid, the leaves narrower, oblong-lanceolate, acuminate and scarcely plicate, the alar cells quadrate, smaller, less numerous and not granulose, the pedicel very rough, and the operculum abruptly longer-apiculate. — Journ. Linn. Soc. viii. 33, t. 6.

Hab. British Columbia (*Douglas, Lyall*); California (*Bolander*).

54. **H. campestre,** Bruch. Monœcious: tufts loose, pale yellowish green or yellow, glossy; stems prostrate or ascending, more or less densely branching and ramulose, densely foliate: leaves erect, open, ovate-lanceolate, subulate-acuminate, serrulate, narrowly costate to the middle, irregularly plicate, glossy, the perichætial abruptly filiform-acuminate, recurved from the middle: capsule oblong-cylindrical, cernuous and subarcuate; pedicel rough in the upper part only; annulus simple; operculum and peristome as in *H. rutabulum.* — *H. rutabulum*, var. *campestre*, Muell. Syn. ii. 368. *Brachythecium campestre*, Bruch & Schimp. Bryol. Eur. t. 545.

Hab. White Mountains, fertile (*Oakes, James*); Sand Lake, Colorado (*Hayden*, 1873), sterile; Cœur d'Alene Lake, N. Idaho, and on Kettle River, British Columbia (*Watson*).

55. **H. Novæ-Angliæ,** Sulliv. & Lesq. Dicœcious: loosely and widely cespitose; tufts rigid, bright green outside, dirty yellow within; stems subprostrate, irregularly subpinnately ramulose; branchlets terete-foliate, not attenuated, subjulaceous: leaves erect, incurved, very broadly ovate, decurrent, short, narrowly acuminate, costate to the middle, serrulate all around, very concave, not plicate; areolation narrowly oblong-hexagonal, shorter and broader at the basilar angles; perichætial leaves ovate, abruptly long-acuminate, recurved from the middle, subecostate: capsule oblong, erect, slightly curved; pedicel short, very rough, purple; operculum long-conical, acuminate; peristome normal; annulus double, large. — Musc. Bor.-Amer. Exsicc. n. 338; Sulliv. Mosses of U. States, 76, and Icon. Musc. 191, t. 118.

Hab. Mountains of New England.

Resembles the following, from which it differs in its smaller size, tufts more compact and less spreading, leaves more compact and not glossy nor plicate, areolation shorter, etc.

56. **H. rivulare,** Bruch, Ms. Dicœcious, the male plants smaller: tufts thick, dirty green; stems prostrate, hard, woody, naked or radiculose; branches ascending or erect, subarcuate, diversely ramulose toward the apex: leaves open, large, broadly ovate, abruptly short-acuminate, serrulate, concave, slightly or not at all sulcate, flat or reflexed on the borders, narrowly costate to above the middle: capsule large, ovate-oblong or turgid-ovate, solid, cernuous and horizontal; pedicel thick and long, scabrous; peristome normal; annulus double. — Lindb. Musc.

Scand. 35. *H. chrysostomum*, Muell. Syn. ii. 368, not Michx. *Brachythecium rivulare*, Bruch & Schimp. Bryol. Eur. t. 546.

Hab. Swamps and wet ground, in woods and mountains; not common. N. W. Montana (*Watson*).

Resembles *H. rutabulum*, but the branches are stronger, divided near the apex and often dendroid, the leaves broader, glossy, short-acuminate, and not plicate, flowers dicœcious, etc.

57. **H. populeum**, Hedw. Monœcious: tufts flat, green, somewhat glossy; stems creeping; branches and branchlets erect or incurved, attenuate at the apex: leaves ovate and oblong, lanceolate, gradually long-acuminate, concave; borders flat, serrulate upward; costa percurrent; areolation very narrow; alar and basilar cells larger, quadrangular-oblong: calyptra large: capsule cernuous, ovate, turgid or gibbous, inflated at the neck, glossy, contracted under the orifice when empty; pedicel purple, slightly scabrous above, smooth toward the base; segments split; cilia one or two, short or unequal, appendiculate; annulus simple, narrow, persistent. — Spec. Musc. 270, t. 70. *H. viride*, Lam.; Lindb. Musc. Scand. 35. *Brachythecium populeum*, Bruch & Schimp. Bryol. Eur. t. 535, 536. *B. plumosum*, var. *reflexum*, Austin.

Var. **majus**. More robust and densely foliate: leaves longer. — Bruch & Schimp. l. c., as *Brachythecium*.

Var. **longisetum**. Larger and more rigid: leaves erect or subsecund: capsule long-pedicellate. — Bruch & Schimp. l. c.

Var. **subfalcatum**. Slender; branches incurved: leaves subfalcate, soft, glossy. — Bruch & Schimp. l. c.

Hab. Plains and mountains of the Atlantic States; mostly on granite boulders.

58. **H. plumosum**, Swartz. Monœcious: plants more robust than in the last; tufts short, dense, yellowish or dirty green; stems hard, densely ramose; branches mostly simple, erect or arcuate, densely foliate, pinnately ramulose: leaves open or homomallous, broadly ovate or deltoid-ovate, short, obliquely acuminate, entire, solid, shining, costate to the middle: capsule slightly longer than in the last, but of the same form, light brown, black when old; pedicel smooth below; peristome perfect; cilia two, as long as the segments, appendiculate; annulus simple and persistent. — Musc. Suec. 66. *H. pseudo-plumosum*, Brid. Musc. Recent. ii. 2. 108; Muell. Syn. ii. 350; Lindb. l. c. *H. chrysostomum*, Michx. Fl. Bor.-Am.

ii. 319. *Brachythecium plumosum*, Bruch & Schimp. Bryol. Eur. t. 537.

Var. **homomallum.** Small; branches falcate: leaves secund, narrower: capsule small, ovate. — Bruch & Schimp. l. c., as *Brachythecium.*

Hab. Moist rocks in mountains, and borders of waterfalls; South and North; common and variable.

More robust than the last, with broader and shorter-acuminate leaves, dirty yellow; capsule longer; habitat subaquatic.

Subgenus IX. SCLEROPODIUM.

Habit and mode of growth of *Brachythecium.* Areolation still narrower vermicular, much enlarged and hyaline at the decurrent base. Flowers diœcious. Capsule suberect or cernuous, oblong-cylindrical or ovate, more or less incurved. Pedicel rough. Teeth of the peristome lamellate on the inside; segments split on the keel; cilia two or three, as long as the segments, appendiculate. Annulus double. — *Scleropodium*, Schimp.

59. **H. cæspitosum,** Wils. Densely cespitose, the tufts bright or dirty green, soft; stems rooting, densely ramulose; branchlets erect or incurved: leaves soft, open or subsecund, loosely imbricate when dry, ovate-lanceolate, acuminate, those of the branches oblong-lanceolate, acute or blunt at the apex, all concave, minutely serrulate all around, costate to above the middle, the costa sometimes forking: capsule suberect, oblong-subcylindrical, slightly incurved; operculum convex, rostellate. — Engl. Bot. Suppl. t. 2878, and Bryol. Brit. 344, t. 55. *Scleropodium cæspitosum*, Bruch & Schimp. Bryol. Eur. t. 556.

Hab. On the ground, and upon shaded rocks among redwoods, California (*Bolander*); Alaska (*Kellogg*); not common.

60. **H. Californicum,** Lesq. Differing evidently from the last in its loosely intricate tufts and slender stems with long filiform branches: leaves ovate-lanceolate, more or less long-pointed, mostly entire, rarely or slightly serrulate at the apex; the costa longer, vanishing below the apex; basilar cells more numerous, small, nearly square, generally filling the whole base of the leaves: capsule longer, cylindrical-oblong, pale green, subcernuous; pedicel longer, rough and reddish in the upper

part only, smooth and yellow below; lid large, conical, mamillate. — Trans. Amer. Phil. Soc. xiii. 13.

Hab. On rocks and dry sand, near the bay of San Francisco (*Bolander*).

61. **H. illecebrum,** Schwaegr. In more or less dense yellowish or dirty green tufts; stems irregularly branching, subpinnately ramulose; branchlets short, arcuate, turgid and obtuse at the apex: leaves erect-spreading when moist, imbricate when dry, ovate, with a short recurved acute point, very concave, minutely serrate at the apex, shining; costa ascending to above the middle, rarely forked: capsule horizontal, turgid, ovate, brown, often of two colors; pedicel thick, very rough; operculum convex-conical, apiculate. — Spec. Musc. ii. 225. *Scleropodium illecebrum*, Bruch & Schimp. Bryol. Eur. t. 557.

Hab. Shady sandy ground, San Francisco, California (*Bolander, Gibbons*); Alaska (*Kellogg*).

Very variable; secondary stems sometimes dendroid.

Subgenus X. ISOTHECIUM.

Primary stems creeping, the secondary erect, more or less dendroid; branches close, fasciculate, curved on one side, or flagellate and stoloniferous. Leaves small, close, open or imbricate when dry, ovate-oblong, acute or acuminate, rarely smooth, more or less distinctly papillose on the back, costate to the middle or above; areolation minute, vermicular-oblong, the basilar short-angular or ovate. Inflorescence diœcious. Capsule regular, suberect, oval-oblong. Operculum short-rostrate. Pedicel smooth, except in the last species.—*Isothecium*, Brid.

The type of this subgenus is *H. myosuroides*, placed by Schimper in *Eurhynchium*. Some of the American species described here have a marked resemblance to that moss, differing essentially in the areolation being slightly papillose.

62. **H. myosuroides,** Linn. Tufts soft, pale green; primary stems slender, long-creeping and radiculose, with small leaves; secondary stems erect, branching and tree-like, very ramulose, flagelliform; branches and branchlets inclined to the same side: leaves of the secondary stem spreading, cordate-lanceolate and narrowly acuminate, the rameal gradually narrower and oblong-lanceolate to lanceolate, those upon the

branchlets more or less distinct, sometimes secund, minutely serrate all around, narrowly costate to above the middle, concave at the angles; areolation very close and narrow, the alar yellow; perichætial leaves sheathing at base, abruptly narrowed into a long slender recurved flexuous point, the inner only thinly costate: capsule cernuous or subhorizontal by the curving of the pedicel, oval-oblong; operculum short-rostrate; cilia shorter than the segments; annulus large. — Spec. Pl. 1130. *Isothecium myosuroides*, Brid. Bryol. Univ. ii. 369; Bryol. Eur. t. 534. *Eurhynchium myosuroides*, Schimp. Syn. 549.

Hab. On trees; Nova Scotia (*James*); White Mountains (*Oakes*); California (*Bolander, Watson*); Oregon (*Hall*).

63. **H. stoloniferum**, Hook. Ramification as in the last, the plants generally larger; branch-leaves more crowded, densely imbricate when dry, more elliptical, minutely papillose on the back, costate beyond the middle, more distinctly serrate: capsule drooping; cilia as long as the segments. — Musc. Exot. t. 74; Mitt. Journ. Linn. Soc. viii. 34; Lesq. Mem. Calif. Acad. i. 31; Sulliv. & Lesq. Musc. Bor.-Am. Exsicc. (ed. 2), n. 425. *Isothecium stoloniferum*, Brid. l. c. 371. *H. myosuroides*, var. *stoloniferum*, Muell. Syn. ii. 500.

Hab. Common on trees upon the Pacific Coast, from California to Alaska (Fort Colville, *Watson*), and very variable. The species varies even upon the same tuft, according to degree of exposure to fog and wind. The characters of the next five species cannot be considered permanent.

64. **H. spiculiferum**, Mitt. Leaves (below the perichætium) lanceolate-acuminate from a cordate-ovate base, smooth, nerved for three-fourths of the length, the borders reflexed below, serrulate above; upper leaves narrower, papillose on the back, those of the branchlets elliptical-lanceolate, very acute, concave, acutely papillose on the back, the costa denticulate at the apex, and the borders plane and serrulate; perichætial leaves erect, oblong at base, serrulate, recurved above, costate to above the middle: capsule short-pedicelled, oblong, subsymmetrical, horizontal; operculum conical; segments cleft between the articulations; cilia solitary. — Journ. Linn. Soc. viii. 34.

Hab. British Columbia (*Lyall, Douglas*).

Habit of *H. myosuroides*, with the branchlets more attenuated and more curved, and the whole plant a little larger. It appears to differ from *H. stoloniferum* in its more slender habit, more abundant papillæ on the

branch-leaves, the reflexed margins of the stem-leaves, the more strongly one-nerved perichætial leaves, and the solitary cilia. — (*Mitten*).

65. **H. acuticuspis,** Mitt. l. c. Leaves loosely imbricate; those below the perichætium cordate-ovate, narrowly long-acuminate, minutely serrulate on the borders, nearly smooth at the cuspidate apex, with a very short diffused costa, forking or entire, vanishing in the middle; cells of the basal angles obscured or dusky; leaves of the branchlets elliptical-ovate, acute, serrulate, nerved to the middle, smooth on the back; the perichætial subulate from an oblong ecostate base, recurved, very entire: capsule on a short pedicel, oval, inclined; lid conical; cilia two, shorter.

HAB. British Columbia (*Douglas*).

Mitten, who had seen only two stems of this moss, says that it may be *H. Brewerianum*, Lesq., but that the description of that species is not sufficiently complete to be quite certain.

66. **H. Brewerianum,** Lesq. In compact dark green or yellowish green tufts; stems creeping, simple at base, radiculose, fasciculately branching above; branches simple, erect, or subcurved, julaceous when dry, narrowed toward the base or inflated in the middle: leaves imbricate, appressed when dry, open when damp, those of the stem distant, broadly ovate-lanceolate, long-acuminate, serrulate at the apex, the costa disappearing in the middle; branch-leaves shorter and broader, broadly ovate-lanceolate, short-acuminate, sharply serrulate above, costate to above the middle; areolation at base ovate, oblique and irregular, oval in the middle, broader and rhomboidal-obtuse toward the apex, subpapillose: capsule erect, cylindrical-ovate, turgid below, constricted under the orifice; operculum conical-rostellate or conical-acute; cilia two, robust, equal to the segments. — Trans. Amer. Phil. Soc. xiii. 12.

Var. **lutescens.** Pale dirty yellow; branches longer, stoloniferous: perichætial leaves shorter, acuminate, serrulate; areolation shorter and broader: capsule longer, subcernuous; cilia slender.

HAB. Granite rocks near Mission Dolores (*Bolander*); Monterey (*Watson*); Sierra Nevada (*Brewer*).

The color of the plants, due to exposure to the sun, the compact tufts, the branches nearly simple, rarely attenuated or stoloniferous, terete or julaceous by the imbrication of the leaves, the capsule somewhat longer and generally erect, are the essential characters separating this species from *H. stoloniferum.*

67. **H. aggregatum,** Mitt. Primary stems creeping; branches erect, closely aggregated, simple, curved, attenuate: lower leaves spreading, broadly hastate, ovate-acuminate, subecostate; those on the middle of the branches broadly ovate; those near the top costate-acuminate, subjulaceous, imbricate, serrulate toward the acute apex, the medial nerve prominent; perichætial leaves ovate-lanceolate, acuminate, nerved to the middle, serrate and reflexed at the apex: capsule cylindrical, irregular, inclined; operculum conical, acuminate; segments narrow; cilia solitary, half as long as the segments. — Journ. Linn. Soc. viii. 35, t. 6.

Hab. Vancouver Island (*Lyall*); British Columbia (*Douglas*).

The author compares it, on account of the julaceous imbrication of the leaves, to some states of *Pterogonium gracile*, while other stems with less imbricated leaves have a resemblance to *H. myurum*.

68. **H. aplocladum,** Mitt. l. c. Stems procumbent, radiculose, curved downward at the summit; branches few, nearly simple, often attenuate, recurved at the apex: leaves spreading, cuspidate, imbricate, on the upper part of the branches ovate, acute, very entire, costate to below the point; those at the top of the branches broader, more obtuse, serrulate; alar cells round-quadrate, obscure, the upper oblong; perichætial leaves long, erect, ovate-lanceolate, acuminate, nerved to above the middle, serrulate at the apex: capsule suberect, oval-cylindrical; operculum convex, acuminate; pedicel long, nearly smooth.

Hab. Northwest coast of America (*Douglas*).

Mitten states that it is not unlike *H. acuminatum*, Beauv., but that the leaves are quite smooth and the habit appears to be different. The roughness of the pedicel is so slight that it is seen only when specially sought.

69. **H. lentum,** Mitt. Dicœcious: leaves spreading, loosely imbricate, cuspidate-imbricate at the top of the branches, the lower broader and shorter, in the middle ovate and short-acuminate, those of the branchlets ovate-lanceolate or at the apex broader and more obtuse, narrowly serrulate, costate to above the middle; cells at the basal angles broader, mixed with narrow ones, and with thickish walls, the upper narrow; perichætial leaves ecostate, clasping at base, serrulate, recurved, entire at the apex: capsule oval-cylindrical, suberect, irregular; pedicel rough; segments solid, with single cilia equalling them in length; membrane produced to one-third the length of the teeth. — Journ. Linn. Soc. viii. 36.

Hab. Northwest coast of America (*Douglas*).

Differs from *H. aplocladum* in its rough pedicel and broader leaves, the perichætial spreading. A few fragments of this species only have been seen. It appears to be about the size of the common *H. myurum*. The scabrous seta of this moss may be considered a new feature in the subgenus to which it is here referred, but after consideration of the characters which constitute the group *Isothecium*, it becomes evident that it cannot be defined distinctly from the groups *Brachythecium* and *Scleropodium* of Schimper. — (*Mitten.*)

Subgenus XI. EURHYNCHIUM. (Pl. 6.)

Plants more or less distinctly pinnate-ramulose. Leaves open, rarely subsecund, cordate at base and decurrent, broadly ovate or oblong, acuminate, serrate all around, costate, subscarious, rarely soft; cells smooth, or slightly papillose in some American species, narrowly rhomboidal, subvermicular, enlarged at the basal angles. Perichætial bud rooting. Calyptra fugacious. Capsule on a rough or smooth pedicel, cernuous or horizontal, oval-oblong. Operculum more or less long-rostrate. Peristome of *Brachythecium*. Annulus compound, rarely none. — *Eurhynchium*, Schimp.

* *Leaves narrowly areolate, glossy, striate.*

\+ *Pedicel smooth; flowers monœcious or pseudo-monœcious.*

70. **H. strigosum,** Hoffm. In loose flat mats or in dense inflated tufts; primary stems creeping, stoloniferous, with distant leaves, the secondary prostrate or erect, ramulose; branchlets gradually attenuate, sometimes flagelliform: leaves open, ovate or triangular-lanceolate upon the branchlets and gradually narrowly acuminate, those of the small branchlets short and less acute, or blunt at the apex; paraphyllia small, round-ovate; cells narrowly rhomboidal, the alar oval-quadrate and larger: flowers pseudo-monœcious; annual buds of male flowers, containing antheridia without paraphyses, adhering to the radicles of fertile plants; perichætial leaves abruptly narrowed into a long filiform flexuous point, with a thin costa or ecostate: capsule cernuous and subhorizontal, oval-oblong or subcylindrical, broadly annulate; operculum rostrate, convex at base; teeth narrowly lamellose inside; cilia two, slender, not appendiculate, a little shorter than the segments. — Deutschl. Fl. ii. 76. *H.*

pulchellum, Hedw. Spec. Musc. 265, t. 68. *Eurhynchium strigosum*, Bruch & Schimp. Bryol. Eur. t. 519.

Hab. Shady sandy ground, in hilly regions and mountains; common.

71. **H. diversifolium**, Schimp. Ms. Much like the last; tufts more compact, dirty yellow, stoloniferous; branches and branchlets shorter, erect, julaceous: branch-leaves closer, those of the branchlets ovate, obtuse, narrowly costate or ecostate, more distinctly serrulate; perichætial leaves subsquarrose, ecostate. — *Eurhynchium diversifolium*, Bruch & Schimp. Bryol. Eur. t. 520. *H. strigosum*, var. *diversifolium*, Lindb. Musc. Scand. 34.

Hab. Dry sandy hills, under chestnut trees, Ohio (*Lesquereux*); shaded banks, New Jersey (*Austin*).

72. **H. Boscii**, Schwaegr. Plants robust, in wide loose dark golden yellow mats; stems prostrate, subpinnately branching; branches mostly simple, obtuse, turgid, terete-foliate: leaves closely imbricate, clasping at base, oblong-ovate, narrowed to a twisted filiform point, cochleariform, concave, scarious, shining, shortly bicostate or simply costate to the middle; areolation narrowly linear, the basilar cells shorter, thick, yellowish brown; perichætial leaves narrowly long-acuminate, the inner erect: capsule oblong, erect-incurved, annulate; segments more or less split; cilia three, solid, and nearly as long. — Suppl. i. 2. 223; Sulliv. Mosses of U. States, 70, and Icon. Musc. 167, t. 106. *H. illecebrum*, Hedw. Spec. Musc. 252, t. 66, excl. syn.

Hab. On the ground and on sandstone rocks in hilly wooded districts; not uncommon, but rarely in fruit.

This fine moss is without close analogy to any other species.

\+ \+ *Pedicel rough.*

73. **H. colpophyllum**, Sulliv. Ms. Tufts soft, wide, dirty green; stems prostrate; branchlets close, erect, tumid: leaves scarious, open, loosely incumbent, ovate, concave, abruptly acuminate, blunt at the apex; costa stout, prominent on the back, abruptly disappearing above the middle and toothed at the apex; areolation long-linear, acutely hexagonal, the alar and basilar cells nearly similar: capsule cylindrical-oblong, slightly incurved, constricted under the orifice when empty; operculum conical at base, rostrate; peristome normal; annulus double. — *Eurhynchium colpophyllum*, Sulliv. Icon. Musc. Suppl. 95, t. 71.

HAB. California (*Bigelow*, 1854).

Similar to the European *H. crassinervium*, differing especially in the scarious leaves with a shorter blunt point, the costa not thick, and the areolation longer and narrower, the perichætial leaves ecostate, and the capsule longer and oblong-cylindrical.

74. **H. piliferum,** Schreb. Plants irregularly and loosely cespitose; stems long, flexuous, prostrate, irregularly branching, subpinnately ramulose, without radicles: leaves somewhat loose, erect, open, ovate-oblong, abruptly narrowed into a long narrow flexuous point, concave, the basilar angles long, decurrent, pellucid; the border minutely serrulate all around; perichætial leaves squarrulose, subecostate: capsule long-pedicellate, oval-oblong or cylindrical, arcuate, constricted under the orifice and very arcuate when empty; operculum large, with a long incurved beak from a high convex base; peristome large; teeth long; segments long-subulate; cilia two or three, slender, nearly as long as the segments, not appendiculate.—Spicil. Fl. Lips. 91; Hedw. Musc. Frond. iv. 35, t. 14; Sulliv. Mosses of U. States, 105. *Eurhynchium piliferum*, Bruch & Schimp. Bryol. Eur. t. 531.

HAB. Meadows, borders of woods; rare in fruit.

75. **H. prælongum,** Linn. Much like the last, differing in its wide flat loose bright or dark green mats, the stems very slender, prostrate their whole length, the leaves serrulate all around, the perichætial very narrowly costate, the segments perforated and not split open, and the cilia appendiculate.—Spec. Pl. 1125; Hedw. l. c. 76, t. 29. *Rhynchostegium prælongum*, DeNotaris, Briol. Ital. 86. *Eurhynchium prælongum*, Bruch & Schimp. Bryol. Eur. t. 524.

HAB. British Columbia (*Lyall*), as quoted by Mitten, who makes it the equivalent of *H. Stokesii.*

A species very difficult to separate from *H. hians*, which appears to be an American variety of it. The true *H. prælongum* has scarcely been found on this continent; at least we have seen nothing referable to it.

76. **H. Sullivantii,** Spruce, Ms. Plants small, densely cespitose or loosely intricate, pale green, dirty yellow below; stems slender, subfastigiately ramulose, the branchlets erect: leaves erect, narrowly ovate-lanceolate, long-acuminate, concave and recurved on the borders at base, sparsely papillose on the back, costate to above the middle; cells minute, flexuous, linear, obtuse, those of the angles subquadrate; perichætial leaves

oblong, sheathing at base, narrowed to a filiform flexuous point, subecostate: capsule oval-oblong, gibbous-ovate; operculum conical, short-rostrate; peristome normal; annulus simple, persistent. — Sulliv. Musc. & Hepat. of North. U. States (1848, correction), Mosses of U. States, 69, and Icon. Musc. 165, t. 105. *H. prælongum*, Sulliv., Gray's Manual, ed. 1, 670.

Hab. On the ground in the margins of woodlands, by brooks, etc.

Intermediate between *H. prælongum* and *H. Whippleanum*, differing from the first in its shorter operculum, and the slenderly acuminate leaves, scarcely papillose on the back. In *H. Whippleanum*, the exannulate capsule is abruptly horizontal, the lid is shorter and conical-apiculate, and the leaves of a thicker texture, strongly papillose, and with a thick pellucid costa reaching nearly to the apex.

77. **H. hians**, Hedw. Plants depressed, cespitose, yellowish green, shining; stems with few branches, flexuous, creeping; branchlets distichous, short, nearly simple: leaves loose, flat or spreading, cordate-ovate, more or less long-pointed, plano-concave, recurved on the borders, serrulate only above, narrowly costate to above the middle; areolation long, hexagonal; perichætial leaves long, narrowly short-acuminate, sharply serrate at the apex, squarrose, the inner subecostate: vaginule hirsute by long protruding paraphyses: capsule oval-oblong, cernuous, subincurved; lid long, subulate-rostrate from a convex-conical base; teeth prominently lamellose inside; segments as long as the teeth, cleft; cilia two, a little shorter than the segments. — Spec. Musc. 272, t. 70; Sulliv. Mosses of U. States, 69, and Icon. Musc. 163, t. 104. *Pterigynandrum apiculatum*, Brid. Musc. Recent. Suppl. i. 137. *H. prælongum*, Muell. Syn. ii. 446, in part.

Hab. Moist shady banks, hillsides in woods; common.

78. **H. Stokesii**, Turn. Tufts rigid, somewhat inflated, bright or dirty green; stem thick, solid; branches simple below, densely pinnate and bipinnate above with stout simple rigid squarrose-foliate branchlets: stem-leaves distant, divaricate and recurved, costate, acuminate, excavate at the decurrent angles, those of the branchlets smaller, erect-spreading, broadly ovate-lanceolate, acuminate, all narrowly costate to below the point, sharply serrate all around; perichætium squarrose, the inner leaves long, filiform-acuminate, serrate, ecostate: capsule horizontal, subpendent when dry, oblong or oval, subcylindrical and constricted under the orifice when dry and empty; operculum

long-rostrate from a conical base, the subulate beak turned upward; peristome and annulus as in *H. prælongum*. — Musc. Hib. 159, t. 15. *H. prælongum*, var. *Stokesii*, Brid. l. c. ii. 103. *Eurhynchium Stokesii*, Bruch & Schimp. Bryol. Eur. t. 526.

Hab. Shady grassy slopes, Northwestern America; common.

79. **H. Oreganum**, Sulliv. Closely allied to the last, differing in the plants being larger, more robust, very long and creeping, once or twice branched, regularly and closely pinnately ramulose, the leaves thinner and firmer, with longer and narrower areolation, the basal angles not so much excavated, and the perichætial leaves reflexed (not simply spreading). — Mem. Amer. Acad. iv. 172 (1849), and Bot. Wilkes Exped. Musc. 16, t. 13, B.

Hab. Puget Sound (*Pickering*, *Lyall*); California (*Bigelow*, etc.).

Subgenus XII. RAPHIDOSTEGIUM.

Generally small, drooping-cespitose, irregularly ramose and ramulose. Leaves spreading, glossy, open all around or subsecund, those of the branches and stems similar, oblong-lanceolate, acuminate, ecostate or shortly bicostate at base; borders reflexed; areolation minute, linear, flexuous, with 3 to 5 cells at the basal angles oblong and inflated. Capsule cernuous, horizontal or suberect, oval-oblong. Operculum long-subulate, rostrate. Pedicel generally smooth.

80. **H. demissum**, Wils. Monœcious: tufts small, yellowish or dirty green: leaves imbricate, compressed, or subsecund, ovate or oblong-lanceolate, ecostate, marked at base by two short striæ, very entire; basilar cells yellow; perichætium closely imbricate: capsule inclined, small, horizontal, oval-oblong, yellow, exannulate, constricted under the orifice when empty; operculum large, with a slender beak as long as the sporangium; pedicel very slender, curved above; teeth orange. — Engl. Bot. Suppl. t. 2740. *Rhynchostegium demissum*, Bruch & Schimp. Bryol. Eur. t. 507.

Var. **Carolinianum**. Branches longer, flaccid, dirty green: leaves revolute on the borders all around. — *H. demissum*, Sulliv. Musc. Allegh. n. 48. *H. Carolinianum*, Muell. Syn. ii. 327. *H. demissum*, var., Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 298[b].

Var. **Marylandicum.** More robust, green; branches subcuspidate at the apex: leaves broadly ovate-acuminate, with borders erect: pedicel much stouter; capsule oblong, subcernuous, contracted at the orifice. — *H. demissum*, var., Sulliv. Musc. Allegh. n. 49; Sulliv. & Lesq. l. c., n. 298[c]. *H. Marylandicum*, Muell. l. c. 328.

Hab. Wet rocks in the mountains, and borders of streams, in the Southern States; sometimes immersed.

81. **H. Novæ-Cesareæ**, Austin. Dicœcious: in glossy yellow flat patches; stems prostrate, slender, filiform, with few short simple suberect branches: lower leaves spreading, the upper appressed and subsecund, roundish-apiculate, concave, serrulate, obscurely two-nerved at base, the margins slightly reflexed below: fruit unknown. — Musc. Appal. n. 440. *H. micans*, Wils. in Hook. Brit. Fl. ii. 86, not Swartz. *Chrysobryum micans*, Lindb.; Sulliv. Icon. Musc. Suppl. 91, t. 67. *Rhynchostegium Novæ-Cesareæ*, Austin in Coult. Bot. Gaz. i. 30.

Hab. On rocks subject to inundation, in mountain rivulets; Shawangunk Mountain, New Jersey (*Austin*); Alleghany Mountains, Pennsylvania (*Wolle, Rau*).

82. **H. recurvans**, Schwaegr. Dicœcious: in wide depressed pale green or yellowish brown tufts; stems prostrate, reddish, pinnately and densely ramulose; branchlets plano-foliate: leaves close, imbricate, secund, thin, soft, pale, concave, ovate-lanceolate, filiform-acuminate, serrulate at the apex, narrowly recurved, obsoletely bicostate; cells of the basal angles dirty yellow; perichætial leaves gradually long-acuminate, serrulate at the apex: capsule short, turgid, oblong, inclined, slightly incurved, exannulate; operculum more or less long-rostrate from a conical base; teeth and segments large; cilia two, stout, nearly as long. — Suppl. i. 2. 289, and ii. 1. 163, t. 146; Sulliv. Mosses of U. States, 71, and Icon. Musc. 177, t. 3. *Leskea recurvans*, and *L. squarrosa*, Michx. Fl. Bor.-Am. ii. 311, 312.

Hab. On trees and decayed logs in mountain districts; very common, and variable in size.

83. **H. cylindricarpum**, Muell. Dicœcious: in flat broad intricate mats, green passing to dirty yellow; stems slender, creeping, with few branches, pinnately ramulose; branchlets slender: leaves compressed, two-ranked, or falcate-secund, narrowly oblong-lanceolate, acuminate, concave, sharply serrate at

the apex; borders recurved below; alar cells large, subquadrate, vesiculose, the upper hyaline; perichætial leaves loosely imbricate, erect, the inner gradually narrowed to a filiform coarsely dentate point: capsule long, cylindrical-oblong, regular, erect or slightly inclined; operculum oblique-conical, long-rostrate; cilia none or rudimentary; annulus none. — Syn. ii. 308; Sulliv. Mosses of U. States, 71, and Icon. Musc. 173, t. 109. *Leskea tenuirostris*, Schimp. Ms.; Sulliv. in Gray's Manual, ed. 1, 668.

Hab. On decayed logs in woods; New Jersey to Ohio and southward; not common.

84. **H. microcarpum,** Muell. Monœcious: in very small intricate tufts, shining green or golden tinted; stems prostrate, with short recurved or incurved branches: leaves close, subhomomallous, narrowly oblong-lanceolate, short-acuminate, subserrulate at the apex, marked with two basilar short striæ; areolation loose, linear-fusiform, the alar cells much larger, the upper quadrate, the lower 3 to 5 on each side oblong, inflated, yellow; perichætial leaves oblong-acuminate: calyptra persistent, descending to below the orifice of the capsule: capsule very small, oval or oblong, erect, thin, slightly constricted under the red orifice when dry; operculum long, subulate-rostrate from a depressed conical base; teeth marked by a distinct divisional line; cilia simple, short, half as long as the segments; annulus none. — Syn. ii. 326; Sulliv. Mosses of U. States, 71, and Icon. Musc. 175, t. 110. *Leskea adnata*, Michx. l. c. 314.

Var. **anisocarpon,** Sulliv. Capsule subhorizontal, unsymmetrical, short, oblong or subovate, gradually narrowed at base, turbinate and constricted under the orifice when dry. — Icon. Musc. 175. *H. admixtum*, Sulliv. Proc. Amer. Acad. v. 289.

Hab. On trees, in the Southern States, very common and variable; cedar swamps, Ohio. The variety in Cuba (*Wright*); New Jersey (*Austin*).

85. **H. Jamesii.** Monœcious: plants very small, depressed, pale or dirty green, glossy; stems slender, creeping, subpinnately ramulose; branchlets short, horizontal, more or less recurved: leaves somewhat distant, flattened, the lateral spreading, ovate at base, gradually narrowed into a long filiform point, not costate; borders flat or reflexed above, subrevolute on one side toward the base, denticulate above, not costate or obsoletely costate at base; alar cells few, oval or linear, obtuse, somewhat inflated; perichætial leaves short-acuminate, denticu-

late at the apex, the upper tubulose: capsule oblong-ovate, inclined, dilated at the orifice and cylindrical-oblong when dry; operculum rostellate from a conical base; segments slightly open between the articulations, a little longer than the solitary cilia; annulus simple, large. — *Rhynchostegium Jamesii*, Sulliv. Icon. Musc. Suppl. 92, t. 68; Austin, Coult. Bot. Gaz. i. 31.

Hab. Erroll Dam, Androscoggin River, New Hampshire (*James*).

86. **H. laxepatulum.** Like the last in habit, size and color, differing in the open leaves two-ranked and compressed, spinose-denticulate toward the apex, the alar cells twice as large and the lowest vesicular, the capsule shorter, pyriform when dry and much dilated at the orifice, the operculum twice as long and acutely rostrate, the teeth rugose-papillose at the apex, the segments entire, and the cilia none or rudimentary: perhaps dicœcious, the male flowers being unknown. — *Rhynchostegium delicatulum*, James; Sulliv. Icon. Musc. Suppl. 93, t. 69; Austin, l. c. 30.

Hab. Same as the last (*James*).

Subgenus XIII. RHYNCHOSTEGIUM. (Pl. 6.)

Plants larger than in *Raphidostegium*, the stems prostrate, irregularly divided, more or less compressed. Leaves often two-ranked, ovate-lanceolate, acuminate, unicostate or shortly bicostate; areolation somewhat loose, elongated-rhomboidal. Capsule oval, inclined and cernuous. Lid rostrate. — *Rhynchostegium*, Schimp.

87. **H. geophilum,** Aust. Ms. Tufts thin, very soft and loose, bluish or yellowish green, very glossy: leaves flat, distichous, somewhat distant, horizontally spreading, oblong-lanceolate, tapering to a blunt point, distantly serrulate, bicostulate; areolation long, narrow, flexuous, the alar cells few, not hyaline: capsule small, thin, short, ovate-gibbous; operculum conical, long-rostrate, the beak turned upward or downward; segments narrow, linear; cilia two or three, nearly as long as the segments, some of them unequal; annulus large, compound. — *Rhynchostegium geophilum*, Aust. Musc. Appal. n. 345; Sulliv. Icon. Musc. Suppl. 94, t. 70. *H. depressum*, James, Proc. Amer. Philos. Soc. xiii. 114, not Swartz; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. (ed. 2), n. 437.

HAB. Clayey shaded ground, New Jersey (*Austin*); Pennsylvania (*James*); New York (*Peck*).

88. **H. deplanatum,** Schimp. Ms. Dicœcious: fertile plants small, the sterile larger; tufts flattened to the ground, pale green, or yellowish brown in dry places; stems with few branches, irregularly or subpinnately ramulose, branches and branchlets closely adhering to the ground by radicles, like the primary stems: leaves two-ranked, imbricate, ovate-lanceolate, gradually acuminate, thin, concave, serrulate all around, the costa short-obsolete or none; cells linear, fusiform, flexuous, the basilar enlarged, similar: capsule oval-oblong, nearly regular, cernuous, arched, plicate, constricted under the enlarged orifice and turbinate when dry; peristome as in the last species; annulus none. — Sulliv. Musc. Allegh. n. 50, Mosses of U. States, 70, and Icon. Musc. 171, t. 108.

HAB. Dry woods in close thin mats upon clayey ground, stones, or roots of trees; common, but very rarely fruiting. Male flowers unknown.

89. **H. serrulatum,** Hedw. Monœcious: plants widely expanded, pale green; stems closely creeping, long-branching; branchlets distant, distichous or subpinnate: leaves two-ranked, thin, flat, very open, ovate-lanceolate, acuminate, serrulate above, thinly costate to above the middle; areolation loose, long-rhomboidal, similar at the base; perichætial leaves oblong, scarious, whitish, costate, abruptly acuminate, flexuous at the apex: capsule oblong, long-pedicellate, cernuous, incurved; lid long-rostrate, conical at base; segments as long as the teeth; cilia two or three, a little shorter; annulus very large, compound. — Spec. Musc. 238, t. 60; Sulliv. Mosses of U. States, 70, and Icon. Musc. 169, t. 107.

HAB. On the ground in dry woods, in loose thin mats, usually over decayed leaves. Closely allied to *H. confertum*, Dicks.

90. **H. rusciforme,** Weis. Plants loosely intricate, cespitose, pendent or floating, rigid, dark or dirty green; stems prostrate; branches erect, incurved: leaves open, tenacious, narrowed at base, ovate, broadly oblong, acuminate, gradually smaller toward the apex of the branches, distinctly serrulate, costate to below the point; areolation narrowly rhomboidal; alar cells long-oval or linear, obtuse; perichætial leaves ecostate, the upper half-sheathing, abruptly acuminate: capsule ovate, cernuous or subincurved, with a short distinct neck, solid, constricted under the orifice when dry; operculum large, solid,

long-rostrate; teeth dark orange; cilia two or three, unequal; annulus large. — Crypt. Gott. 225. *H. riparioides*, Hedw. Musc. Frond. iv. 10, t. 4. *Rhynchostegium rusciforme*, Bruch & Schimp. Bryol. Eur. t. 515, 516.

Var. **Atlanticum.** Stems very long: leaves longer, subsecund, short-acuminate, obscurely striate, dirty green, glossy. — Bruch & Schimp. l. c., as *Rhynchostegium.*

Var. **inundatum.** Stems much divided, flexuous, prostrate, densely foliate: leaves ovate-oblong, gradually narrowed: capsule short-pedicelled, arcuate, thick. — Bruch & Schimp. l. c.

Hab. Stones and wood, in running water; plains and mountains.

91. **H. curvisetum,** Brid. Monœcious: loosely depressed-cespitose, dark green, irregularly branching and ramulose; branchlets rigid, spreading, incurved: leaves erect-spreading, striate, those of the stems and lower part of branches distant, the terminal crowded, lanceolate and narrowly oblong-lanceolate, acuminate, concave, costate to the middle, more or less distinctly serrulate; cells elongated-rhomboidal, the basilar in three or four rows, oblong, obtuse, hyaline; perichætial leaves few, ecostate, long lanceolate-acuminate: capsule solid, oval or oblong, with a distinct collum, horizontal; pedicel flexuous, rough; operculum yellow, long-subulate, rostrate; cilia nearly as long as the segments, simple or geminate. — Musc. Recent. Suppl. ii. 111; Lindb. Journ. Linn. Soc. xiii. 68. *Rhynchostegium Teesdalii*, Bruch & Schimp. Bryol. Eur. t. 509, excl. syn.

Hab. Fairmount Park, Philadelphia (*James*).

Species insufficiently known and not certainly referable to this subgenus.

92. **H. Caloosiense,** Aust. Monœcious: prostrate, the stems intricate, 6 to 8 c.m. long, subpinnately branching: leaves subflattened, broadly obliquely ovate, subacuminate, the borders plane, obsoletely serrulate toward the apex; costa geminate, distinct to near the middle; areolation loose, rhomboidal, fusiform; paraphyllia long-subulate, subfasciculate: capsule broadly oval, pendent on a short smooth pedicel, much constricted under the orifice when dry, obtuse at base: flowers small. — Coult. Bot. Gaz. iv. 161.

Hab. Low hummocks on the Caloosahachee River (*J. D. Smith, Austin*).

Somewhat like *H. deplanatum* and *H. micans,* but readily distinguished

from the first by its monœcious inflorescence, short pointed entire leaves, and much longer entire paraphyllia; from the second by its more obsoletely serrated leaves, and by the presence of paraphyllia; from both by its darker green color, more copiously branched stems, and much more loosely areolated leaves, the longer costa, and the pendulous capsule. — (*Austin.*)

93. **H. Royæ,** Aust. Diœcious: stems rigid, slender, with few subcompressed branches: leaves scattered, half-open, ovate or ovate-lanceolate, sharply acuminate, somewhat concave, flat and minutely serrate on the borders, costate to above the middle; cells oval and oblong, rhomboidal; perichætial leaves long-subulate, acuminate from an oblong-ovate base, ecostate, subserrate at the apex, squarrose. — Coult. Bot. Gaz. iii. 31.

Hab. California (*Mrs. Jessie Roy*).

92. **H. Brandegei,** Aust. l. c. Densely cespitose, yellowish green; stems erect, nearly simple, slightly tumid and compressed: leaves imbricate, broadly ovate, concave, 2–3-plicate, abruptly short-subulate or filiform, acuminate, flat on the borders, entire or obscurely serrate; costa simple or forking, reaching the middle; cells narrowly oblong, fusiform, strict, the basilar a little longer, short.

Hab. Colorado (*Brandegee*).

The author compares it with *H. murale, H. piliferum, H. Coloradense,* and even with *H. acuminatum,* thus showing the uselessness of descriptions made from incomplete specimens.

Subgenus XIV. THAMNIUM. (Pl. 6.)

Plants dendroid from a subterranean rhizome-like stem; secondary stems erect, solid, woody, with distichous or fascieulate apical branches and branchlets. Leaves 8-ranked, those of the primary stems and of the lower part of the secondary very small, distant, scarious, appressed, the upper gradually larger, green, loosely imbricate, ovate-lanceolate, coarsely dentate or serrate at the apex; areolation dense, narrowly linear, pellucid at the base, gradually shorter-rectangular upward, minutely rhomboidal-quadrate and chlorophyllose toward the apex. Calyptra covering the capsule to the middle. Capsules generally clustered, ovate-oblong, horizontal by the curving of the short arcuate smooth pedicel. Operculum long-rostrate. Peristome large; segments as long as the teeth, cleft between the

articulations; cilia 2 or 3, long, appendiculate. Annulus narrow.—*Thamnium*, Schimp.

95. **H. Alleghaniense,** Muell. Plants green: leaves of the branches and branchlets erect-spreading, oblong-elliptical, broad and short-pointed, the perichætial erect, narrowly acuminate, ecostate: flowers synœcious and monœcious: capsule short-pedicelled, with a broad orifice; annulus simple. — Syn. ii. 502; Sulliv. Mosses of U. States, 69, and Icon. Musc. 161, t. 103. *H. neckeroides*, Hook. & Wils. in Drumm. Musc. Amer. (Coll. II.), n. 119. *Thamnium Alleghaniense*, Bruch & Schimp. Bryol. Eur. *Thamnium*, 4.

Hab. Rocky and shady banks; Pennsylvania, Ohio, Arkansas; St. Louis (*Drummond*). Though not common, it is widely distributed, mostly in the plains, along rocky limestone creeks.

96. **H. neckeroides,** Hook. Differs from the last in the broad sheathing acuminate and reflexed perichætial leaves, and the dicœcious inflorescence. — Musc. Exot. t. 58. *H. Neckera*, Schwaegr. Suppl. iii. 2, t. 288. *Thamnium neckeroides*, Bruch & Schimp. l. c.

Hab. Northwest coast (*Menzies*).

97. **H. Bigelovii,** Sulliv. Dicœcious: branchlets flat: leaves bright green, shining and striate when dry, two-ranked, spreading, oblong-acuminate, flat and serrate at the apex, the borders inflexed on one side; areolation parenchymatose; perichætial leaves lanceolate, linear-acuminate, serrate above, costate: capsule oval, distinctly necked; pedicel thick, arcuate above; inner membrane very large; cilia two, appendiculate; annulus large, compound. — Pacif. R. Rep. iv. 189, t. 9.

Hab. Valleys of the Coast Ranges, and mountains of California (*Bigelow, Bolander*).

Subgenus XV. PLAGIOTHECIUM. (Pl. 6.)

Plants partly prostrate, irregularly branching and ramulose, stoloniferous, rooting, soft and variable in size. Leaves thin, glossy, mostly entire; costa none, or double, very short and thin; areolation long and narrowly rhomboidal-hexagonal, larger at the base, sparingly chlorophyllose. Flowers monœcious, rarely dicœcious; perichætium sheathing, radiculose at base; vaginule smooth. Calyptra very narrow, fugacious.

Capsule suberect, oblique or subhorizontal, oval-oblong, somewhat incurved or arcuate, short-necked, thin, smooth, rarely sulcate when dry. Teeth of the peristome whitish. — *Plagiothecium*, Schimp.

* *Teeth of the peristome distantly articulate; cilia none.*

\+ *Flowers dicœcious.*

98. **H. latebricola,** Lindb. Ms. Plants small, cespitulose, yellowish or bright green, shining; stems short, very slender, ascending, sparingly branching, radiculose at base: leaves loose, erect-spreading, ovate-lanceolate, long-acuminate, decurrent, very entire, slightly concave, recurved on the borders, obsoletely two-nerved; areolation long and narrow; inner perichætial leaves ovate-lanceolate, erect: capsule very small, suberect, oval or oblong, tapering to the base, thin, with a broad orifice and subturbinate when dry; operculum large, apiculate or short-rostrate from a tumid conical base; teeth whitish; segments as long as the teeth, entire, narrow, hyaline-punctate; annulus narrow. — *Leskea latebricola*, Wils. Bryol. Brit. 329, t. 54. *Plagiothecium latebricola*, Bruch & Schimp. Bryol. Eur. t. 494; Lindb. Faun. Flor. Fenn. ix. 32. *H. scitulum*, Aust., Bull. Torr. Club, vi. 44 (?), described from a sterile specimen found mixed with *H. Sprucei* in Drummond's Mosses of British America (n. 190).

Hab. Roots and stumps in swamps; New Jersey and New York (*Austin*).

99. **H. Passaicense.** Differs from the last merely in the abruptly acuminate perichætial leaves, very entire or erose-denticulate at the apex, and the basilar areolation of the leaves with shorter cells, the cells not inflated nor the leaves decurrent; stem-leaves triangular-lanceolate and subcanaliculate-concave. — *Plagiothecium denticulatum*, var. *lætum*, Aust. Musc. Appal. n. 362. *P. Passaicense*, Aust., Bull. Torr. Club. v. 24.

Hab. On rocks, in mountain districts; New Jersey (*Austin*), sterile; Belleville, Canada (*Macoun*), fruiting.

The author remarks that it resembles *H. pulchellum*, and *H. latebricola*, but that it is smaller than either and the smallest of the subgenus. The characters indicated as specific, or as different from those of *H. latebricola*, are not sufficiently marked, as in this last species the base of the leaves is often truncate instead of decurrent, and the basal cells not inflated but only quadrate.

+-+ *Flowers monœcious or diœcious.*

100. **H. trichophorum,** Spruce. Tufts white, dark green; plants prostrate, much branched: leaves distichous, flattened, ovate or oblong, concave, filiform-apiculate, irregularly undulate, plicate lengthwise, recurved, entire on the borders, marked at base by double short striæ instead of nerves; areolation loose, hyaline; perichætial leaves filiform, acuminate, flexuous at the apex: capsule suberect or subincurved, oblong, a little constricted under the orifice when dry and empty, slightly inflated at the collum, brown, darker when old; operculum conical, inflated at base, muticous; peristome pale, soft, the teeth linear-lanceolate, sometimes bifid or irregularly perforated at the apex, the segments split or lacerated between the articulations, whitish when dry, hyaline when moist; annulus of a triple series of small cells remaining attached to the lid. — Ann. Mag. Nat. Hist. ser. 3, iii. 276. *Leskea pilifera*, Swartz, Summ. Veg. Scand. 41. *Plagiothecium piliferum*, Bruch & Schimp. Bryol. Eur. t. 496. *H. denticulatum*, var. *Donianum*, Drummond Musc. Amer. n. 165.

Hab. Portage River, British America (*Drummond*); Oregon (*Hall*).

* * *Teeth more densely articulate; basilar membrane broader; segments with intermediate cilia: leaves two-ranked.*

101. **H. pulchellum,** Dicks. Monœcious: plants small, densely cespitulose, glossy green; branches crowded, erect, fastigiate: leaves crowded, subcomplanate, secund, lanceolate or gradually tapering from the base to an acute point, entire, ecostate: capsule suberect, oblong or obovate; operculum short, conical, obtusely apiculate; peristome pale yellow; cilia two, a little shorter than the segments. — Crypt. Fasc. ii. 13, t. 5. *Leskea pulchella*, Hedw. Spec. Musc. 220, t. 55. *Plagiothecium pulchellum*, Bruch & Schimp. Bryol. Eur. t. 497. *Stereodon pulchellus*, Mitt. Journ. Linn. Soc. viii. 39. *Plagiothecium nitidum*, var *suberectum*, Lindb. Faun. Flor. Fenn. ix. 34.

Var. **nitidulum.** Plants slightly stronger and less compact: leaves longer and long-acuminate: capsule thicker, ovate-oblong, inclined or subcernuous. — *H. nitidulum*, Wahl. Fl. Lapp. 370. *Plagiothecium nitidulum*, Bruch & Schimp. l. c., t. 498. *P. nitidum*, Lindb. l. c. *Isopterygium nitidum*, Lindb. Musc. Scand. 39.

HAB. Rocky Mountains (*Drummond*). The variety on roots of trees near the ground; New York (*C. H. Peck, Austin*); Fort Colville (*Lyall*). Also a form from Davis Straits (*Taylor*), according to Mitten.

102. **H. geminum.** Monœcious: branches ascending, interlaced: leaves ovate or ovate-acuminate, open, variously curved, subsecund or subfalcate, the borders minutely serrulate or entire; costa thick, ascending to the middle; cells long and narrow, a few of them shorter at base; perichætial leaves erect, the inner broader and longer, short-acuminate: capsule oval-cylindrical, suberect, gradually narrowed at the neck; segments narrow; cilia two, nearly as long. — *Stereodon geminus*, Mitt. Journ. Linn. Soc. viii. 39, t. 7.

HAB. Rocky Mountains, at 6,000 to 8,000 feet altitude; associated with the last (*Lyall*).

Somewhat like *H. pulchellum*, but with leaves more gradually narrowed from a wider base, the thin but broad nerve continued to the middle, the margins more or less evidently serrulate from the base to the apex, and the cells only half as long and narrower. — (*Mitten.*)

103. **H. micans,** Swartz. Monœcious: plants small, in very loose flat tufts, whitish yellow or fulvous, shining; stems prostrate, rooting, irregularly divided into few branches and short branchlets: leaves loose, compressed, the lateral spreading at right angles, thin, soft, ovate-lanceolate, narrowly acuminate, obscurely serrulate above; costa basilar, geminate, indistinct; cells narrowly linear, those of the angles few, quadrate-oblong; inner perichætial leaves more or less abruptly acuminate, coarsely serrate at the base of the point: capsule very small, ovate-oblong, slightly incurved on a slender comparatively long pedicel; lid conical, short-acuminate or mamillate; segments nearly entire, as long as the teeth; cilia one or two, short, nodose. — Muhl. Cat. 104, and Adnot. Bot. 175, according to authentic specimens in Muhl. Herb. examined by Sullivant and reported upon by letter to James and Austin. *H. albulum*, Muell. Syn. ii. 280; Sulliv. Mosses of U. States, 71, and Icon. Musc. 179, t. 112. *H. tenerum*, Hook. & Wils. in Drumm. Musc. Amer. (Coll. II.), n. 108, 109.

Var. **fulvum.** Larger; branches long, flattened, sometimes floating, fulvous or dark brown when old. — *H. fulvum*, Hook. & Wils. in Drumm. l. c., n. 110; Sulliv. l. c. 80, and Icon. Musc. 205, t. 125.

HAB. On much decayed wood in moist places; the variety in bogs; Southern States.

104. **H. turfaceum**, Lindb. Monœcious: plants small, cespitulose, bright green, yellowish spotted; stems prostrate, with short subpinnate or fasciculate branches; leaves depressed, flat, the laterals preading horizontally, the upper and lower alternately inclined to the left and to the right, ovate-lanceolate, long-acuminate from an ovate-oblong base, sharply serrate to the middle, ecostate; areolation fusiform or broadly linear, distinctly quadrate or oblong, equilateral at base; perichætial leaves ovate, concave at base, abruptly short-cuspidate and dentate upward: capsule subcernuous and subinclined, oblong-cylindrical, costate and constricted under the orifice when dry; operculum broadly conical, blunt at the apex; peristome normal, with two strong cilia nearly as long as the entire segments; annulus double, large. — Fries, Bot. Notis. 1857, 142, and Fl. Dan. Suppl. t. 117. *Stereodon turfaceus*, Mitt. *Plagiothecium turfaceum*, Lindb. Faun. Flor. Fenn. ix. 33; Sulliv. Icon. Musc. Suppl. 87, t. 65. *Isopterygium turfaceum*, Lindb.

Hab. On the ground and decayed trunks; Alleghany and White Mountains (*James*); New Jersey (*Austin*); Fort Colville (*Lyall*).

105. **H. elegans**, Hook. Dicœcious: plants small, pale green, shining when dry; stem depressed, with few unequal branches; stem-leaves erect-spreading, plane and distichous, narrowly ovate, more or less long-acuminate, concave, short, bicostate at base, slightly serrulate at the apex; cells narrower than in the last, pellucid, but scarcely enlarged at base; perichætial leaves lanceolate-acuminate; capsule horizontal or subpendent by an apical curve of the pedicel, oblong, slightly inflated at the curved neck, constricted under the widened orifice when dry; operculum conical, obtuse or short-rostellate; teeth broadly lanceolate, blunt at the apex; segments entire; cilia three, slender, as long as the segments; annulus simple. — Musc. Exot. t. 9; Schwaegr. Suppl. iii. t. 282. *Plagiothecium elegans*, Schimp. Coroll. 116: Sulliv. Icon. Musc. Suppl. 86, t. 64. *Rhynchostegium elegans*, Lindb. in Hedwigia, ii. 79, and Faun. Flor. Fenn. ix. 47. *Isopterygium elegans*, Lindb.

Var. **terrestre**. Dark green; branches shorter, slightly decurved at the apex. — Lindb. l. c., as *Rhynchostegium*; Aust. Musc. Appal., n. 349.

Hab. Crevices of shaded rocks; Vancouver Island (*Menzies*); White Mountains (*James*); Northern New Jersey, sterile. The variety on the ground in a ravine near Paskack, New Jersey (*Austin*), sterile.

106. **H. denticulatum,** Linn. Monœcious: in flat loose green or yellowish glossy tufts; stems prostrate, stoloniferous, with branches and branchlets erect, plano-foliate: basilar and terminal leaves of the branches small, broadly lanceolate, acute, the medial larger, ovate-oblong, apiculate, inequilateral, decurrent, entire or subserrate at the apex; costa bipartite, very thin, vanishing half-way to the middle; areolation narrowly rhomboidal, enlarged at base, broadly quadrate at the excavate angles; perichætial leaves sheathing, narrowed into a short point, costate to above the middle, the costa thin, simple or forking: capsule long-pedicelled, cernuous, arcuate, cylindrical or oblong, orange-color, slightly constricted under the orifice when dry; operculum conical, apiculate; teeth pale; segments slightly open between the articulations; cilia two or three, unequal, nearly as long as the segments; annulus large, of a triple row of cells.—Spec. Pl. 1122. *Pylaisæa rădicans*, Desv.; Brid. Bryol. Univ. ii. 282, t. 8. *Plagiothecium denticulatum*, Bruch & Schimp. Bryol. Eur. t. 501, 502; Lindb. Faun. Flor. Fenn. ix. 30.

Var. **tenellum.** Smaller than the normal form: leaves narrower, longer-acuminate. — Bruch & Schimp. l. c., as *Plagiothecium.*

Var. **lætum.** Leaves longer, piliform-acuminate: capsule ovate-oblong, suberect; cilia none. — Lindb. l. c. *Plagiothecium lætum*, Bruch & Schimp. Bryol. Eur. t. 495.

Var. **laxum.** Leaves less crowded, erect-spreading, scarcely flattened, smaller, narrower, broadly lanceolate: capsule suberect. — Bruch & Schimp. l. c.

Var. **densum.** Densely cespitose; branches shorter, erect: leaves crowded, imbricate, recurved at the apex: capsule suberect; lid acuminate. — Bruch & Schimp. l. c.

Var. **obtusifolium,** Turn. Leaves elliptical, more or less obtuse. — Musc. Hibern. 146. *H. Donnianum*, Smith, Fl. Brit. iii. 1286. *Stereodon Donianus*, Mitt.

Hab. Decayed trunks in the woods, rarely on stones; varieties *tenellum* and *densum* on mountains, in fissures of rocks.

A very variable moss, often confounded with *H. sylvaticum*, differing in the monœcious inflorescence, the narrower areolation, the conical and not rostrate lid, the smooth capsule, and the compound annulus.

107. **H. Muellerianum,** Hook. fil. Dicœcious: plants very small, loosely cespitose, bright green; stems stoloniferous, creep-

ing, with branches erect, rooting at base and sometimes at apex, complanate-foliate: leaves distichous, spreading, ovate-lanceolate at base, acuminate or subpiliform, long-apiculate, concave, very entire, ecostate, not decurrent at base; areolation narrow, uniform; perichætial leaves half-clasping at base, oblong-ovate, acuminate, entire: capsule subcernuous, obovate, long-necked, enlarged at the orifice and campanulate when dry, pale brown; pedicel short, purple; operculum conical, rostellate; teeth distantly articulate; cilia short, robust, unequal; annulus narrow, simple. — New Zeal. Fl. ii. 476 (name only). *Plagiothecium Muellerianum*, Schimp. Syn. 584; Sulliv. Icon. Musc. Suppl. 89, t. 66.

Hab. Rocky ravines; New Jersey (*Austin*); White Mountains (*James*); Ohio (*Lesquereux*).

108. **H. Sullivantiæ**, Schimp. Ms. Dicœcious: plants in compact pale green or yellowish shining tufts; stems erect, with few branches, scattered leaves, and radicles at base: leaves crowded, subimbricate, oblong-ovate, abruptly and shortly filiform-acuminate, very concave, thin, glossy, serrulate toward the apex; costa bifid, one of its branches sometimes longer; areolation very long and narrow, the basilar a little shorter and broader: perichætial leaves erect, the inner oblong, narrowly acuminate: capsule cylindrical-oblong, constricted at the neck, erect, regular, subinclined, smooth when dry; operculum long-conical, obliquely short-rostrate; cilia in pairs, stout, and nearly as long as the entire segments; annulus simple, large. — Sulliv. Mosses of U. States, 80, and Icon. Musc. 207, t. 126; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 355. *Plagiothecium Sullivantiæ*, Schimp. in Bryol. Eur. *Plagiothecium*, 16.

Hab. Moist sandstone rocks and shaded banks in pine woods, Ohio.

The species published under the authority of Schimper is, as Sullivant remarks (Icon. Musc. l. c.), perhaps too insufficiently characterized to be separated from *Plagiothecium Roeseanum*, Bruch & Schimp. Bryol. Eur. t. 504, and he adds that the better course might be to reduce both of them to *H. sylvaticum*, a very variable species. The appearance of this moss and its mode of growth are strikingly different from those of *H. sylvaticum*, and, even if a variety, the variety is constant in its characters. It seems, therefore, justifiable to preserve a species made by Schimper to honor the name of a very acute lady bryologist, who for years assisted her husband in his researches.

109. **H. sylvaticum**, Huds. Dicœcious: tufts loose, soft, depressed, stoloniferous, dark green: leaves flat, distant, the

lateral spreading, decurrent, broadly ovate-lanceolate, short-acuminate, concave, obsoletely costate, very entire; upper areolation narrowly rhomboidal, gradually longer and narrower downward; the cells of the decurrent angles quadrate-oblong and numerous: male plants mixed with the sterile or in separate tufts; perichætial leaves short, oblong-lanceolate, acute or short-acuminate: capsule long-pedicellate, cernuous and horizontal, cylindrical, contracted into a long neck, sulcate, striate and constricted under the orifice when dry; operculum long-beaked, the beak curved upward; peristome large; the teeth bright orange at base; annulus double. — Fl. Angl. 419. *Plagiothecium sylvaticum*, Bruch & Schimp. Bryol. Eur. t. 503; Lindb. Faun. Flor. Fenn. ix. 28.

Var. **orthocladium.** Branches shorter, erect, densely crowded: leaves shorter, less complanate, a little shining: capsule oval, cernuous. — Schimp. Coroll. 115, as *Plagiothecium. P. orthocladium*, Bruch & Schimp. Bryol. Eur. t. 504.

Hab. Dense shaded rocks, and clayey ground in woods; the variety more rarely found.

110. **H. undulatum,** Linn. Dicœcious: plants large, widely cespitose, whitish green; stems very long, prostrate and arcuate, rooting at the base of the innovations; branches curved downward or ascending, densely foliate, tumid: leaves imbricate-complanate, small and ovate toward the base, gradually larger above and ovate-oblong, more or less abruptly acuminate, narrowed and decurrent at base, transversely undulate-rugose from the middle upward, serrulate at the apex, glossy; costa short, double; areolation very narrowly rhomboidal, small and quadrate at the decurrent angles; lower perichætial leaves recurved, the upper sheathing, longer acuminate, thin, narrowly costate: capsule oblong-cylindrical, arcuate, deeply ribbed when dry, enlarged at the orifice, dirty yellow, passing to brown with age; pedicel long, flexuous; operculum large, rostrate; segments slightly split along the keel; cilia three, stout, nearly as long as the segments; annulus double. — Spec. Pl. 1124; Schwaegr. Suppl. iii. t. 282^{b}. *Plagiothecium undulatum*, Bruch & Schimp. Bryol. Eur. t. 506; Lindb. l. c. 27. *Stereodon undulatus*, Mitt.

Hab. On wet mossy ground, in deep woods; Oregon (*Pickering, Hall*), and California (*Bolander*); Fort Colville (*Lyall*).

* * * *Leaves open or subsecund.*

111. **H. Muhlenbeckii,** Spruce. Monœcious: more or less densely cespitose; stems prostrate or ascending; branches and branchlets crowded, erect: leaves densely crowded, subcomplanate, secund on the branchlets, ovate-lanceolate, gradually narrowed into a long filiform point, decurrent, minutely and distantly serrulate, plano-convex; costa very short and obsolete, double; cells loose, those of the decurrent angles very large, inflated, dark orange; inner perichætial leaves half-sheathing, narrowed into a long flexuous or recurved filiform point: capsule suberect, cernuous, oblong-cylindrical, long-necked, more or less incurved, substriate, irregularly furrowed when dry, often two-colored; operculum long-conical, obtuse; peristome small, the segments entire; membrane large; cilia three, slender, a little shorter than the segments; annulus large, compound. — Ann. Mag. Nat. Hist. ser. 2, iii. 275. *H. striatellum*, Brid.; Muell. Syn. ii. 282. *Plagiothecium Muhlenbeckii*, Bruch & Schimp. Bryol. Eur. t. 499. *P. striatellum*, Lindb. l. c. 32.

Hab. On rocks in subalpine regions, and grassy places in mountains; frequent and variable.

112. **H. Fitzgeraldi,** Renauld, in litt. Closely allied to the last, differing in its shorter and stouter stems, the branches short, intricate (not erect), the leaves not glossy, narrower, nearly entire, and the areolation more opaque, with longer narrower and very chlorophyllose cells.

Hab. Decayed trunks, Florida (*Fitzgerald*).

Though the characters are not very marked, the great difference in habitat authorizes a separation of this peculiar form.

113. **H. pseudo-Silesiacum.** Monœcious: the branches somewhat plano-foliate: upper leaves appressed, the lateral and lower spreading, crowded, oval, narrowly acuminate, ecostate; areolation very narrowly rhomboidal; perichætial leaves imbricate, ovate-lanceolate: capsule oblique or inclined, oval-oblong, thin, pale brown, sulcate the whole length when dry; pedicel short (1 c.m.), straight; operculum broadly conical, short; annulus double, revoluble. — *H. Silesiacum*, Hook. & Wils. in Drumm. Musc. Amer. (Coll. II.), n. 111. *Plagiothecium pseudo-Silesiacum*, Schimp. Proc. Amer. Acad. xiv. 140.

Hab. Near St. Louis (*Drummond*).

Species of uncertain relation.

114. **H. subfalcatum.** Plants prostrate, intricate, cespitose, bright green, glossy; stems irregularly branching: leaves distant, distichous, complanate, obliquely oblong, acute, spreading, horizontally subfalcate by curving backward, serrate-dentate at the apex; borders reflexed toward the base; costa short, double, the nerves of unequal length; areolation narrowly fusiform or linear, a little shorter and broad at base. — *Plagiothecium subfalcatum*, Aust. Musc. Appal. n. 366; Sulliv. Icon. Musc. Suppl. 90, t. 67.

HAB. Crevices of rocks, in the mountains of New Jersey and New York (*Austin*); always sterile.

This species may be referable to a different subgenus.

SUBGENUS XVI. AMBLYSTEGIUM. (Pl. 6.)

Plants very small, sometimes widely expanded, creeping, irregularly ramose and ramulose, without stolons. Leaves spreading uniformly or subsecund, lanceolate or oval-lanceolate, generally simply costate to the middle or to the apex. Flowers monœcious, rarely diœcious. Capsule suberect or cernuous upon a smooth pedicel, oval or oblong-cylindrical, subarcuate, of soft texture. Operculum large, mamillate, blunt or apiculate. Teeth of the peristome solid, closely articulate; segments entire; cilia more or less perfect. The texture of the leaves is soft, the areolation parenchymatous or loosely prosenchymatous, never linear or vermicular. — *Amblystegium*, Schimp.

* *Leaves opaque; areolation parenchymatous, more or less chlorophyllose: flowers monœcious, except in* n. 115.

115. **H. minutissimum**, Sulliv. & Lesq. Plants very small, pale green; stems prostrate, scarcely 1 c.m. long, with bundles of radicles, subpinnately divided into short erect or spreading branches: leaves loose, open, narrowly lanceolate, more or less distinctly serrulate on the borders, ecostate or marked with short striæ; areolation large, oblong; perichætial leaves large, long-acuminate, coarsely dentate above: flowers with scarcely any paraphyses: capsule minute, subovate, more

convex on the upper side, constricted under the large orifice when deoperculate and dry, turbinate, thin, dirty yellow; pedicel slender, 4 or 5 m.m. long; teeth pale yellow, hyaline on the borders; cilia 1 or 2, as long as the segments; annulus double, persistent. — Musc. Bor.-Amer. Exsicc. n. 343; Sulliv. Mosses of U. States, 78, and Icon. Musc. 195, t. 120.

Hab. Moist rocks in shaded ravines, in the Central States, Northern New Jersey, Pennsylvania, Ohio, Illinois; rare.

116. **H. Sprucei,** Bruch Ms. Dicœcious: plants very small, loosely cespitose; stems capillary, those of the fertile tufts more compact and ascending, with branches and branchlets erect, those of the loose sterile tufts very long and creeping: leaves loose, spreading, oval or oblong, lanceolate, entire, nerveless, loosely areolate, green; perichætial leaves similar, serrate at the apex; antheridia without paraphyses: capsule minute, erect or slightly incurved, oval and obovate, with a distinct inflated neck and enlarged orifice when dry; operculum mamillate, obtuse; teeth pale; cilia none; annulus very narrow, simple. — Muell. Syn. ii. 415. *H. confervoides*, Drumm. Musc. Amer. n. 190. *Amblystegium Sprucei*, Bruch & Schimp. Bryol. Eur. t. 561.

Hab. Santa Fe, New Mexico (*Fendler*); Colorado (*E. Hall, Wolf & Rothrock*); British America (*Drummond*).

117. **H. subtile,** Hoffm. Widely cespitose, dark green, strongly coherent; stems with short erect branches: leaves loose, subsecund or spreading, narrowly lanceolate from an ovate base, entire, ecostate or with obscure traces of a medial nerve; perichætial leaves long and narrowly acuminate, entire: capsule suberect or subcernuous, oblong, narrowed to a short collum, pale yellow, constricted under the orifice when empty; operculum highly convex, apiculate; peristome as in the last species; annulus very narrow. — Deutsch. Fl. ii. 70. *Leskea subtilis*, Hedw. Musc. Frond. iv. 23, t. 9. *Amblystegium subtile*, Bruch & Schimp. Bryol. Eur. t. 561.

Hab. Roots of trees; New England, Canada, Goat Island, etc.; not rare.

118. **H. confervoides,** Brid. Differs from the last in its habitat on stones, in the dark green color of the tufts, the stems irregularly branching, pinnately and closely ramulose, the leaves more narrowly acuminate, the areolation more chlorophyllose, the capsule cernuous, often horizontally inclined and reddish

brown, and the peristome more perfect, with double cilia. — Musc. Recent. Suppl. ii. 153. *H. Conferva*, Schwaegr. Suppl. ii. 1. 158, t. 142. *Amblystegium confervoides*, Bruch & Schimp. Bryol. Eur. t. 562.

HAB. Moist limestone in woods; Ohio, Canada, White Mountains.

119. **H. serpens,** Linn. More or less densely cespitose, dirty or yellowish green; stems creeping, radiculose, densely ramulose; branchlets variable in length, flexuous, erect: stem-leaves remote, spreading, ovate-lanceolate, narrowly costate to below the apex, those of the branches more crowded, often secund, longer acuminate and more chlorophyllose; leaves of the pale perichætium oblong, erect, narrowed into a short point, broadly costate and plicate: capsule long-cylindrical, incurved, cernuous or subarcuate, constricted under the orifice when dry, yellowish brown, often of two colors; operculum convex-conical; teeth light brown; segments slightly perforated on the keel; cilia 2 or 3, as long as the segments; annulus of a triple series of small cells. — Spec. Pl. 1130. *Amblystegium serpens*, Bruch & Schimp. Bryol. Eur. t. 564.

HAB. On decayed wood, and in shady moist places on the ground; not frequent in the Eastern States, common in California, and extremely variable.

120. **H. radicale,** Beauv. Loosely cespitose; stems rooting and creeping, irregularly and densely ramulose, the branchlets short, rigid, suberect: leaves spreading, more crowded than in the last species, broadly ovate and cordate at base, narrowly lanceolate and long-acuminate, strongly costate to the apex; areolation more dense, exactly parenchymatous, elongated-rhomboidal, round-quadrate or rectangular at the base and the basal angles, thick-walled, chlorophyllose; perichætial leaves oblong, narrowly acuminate, costate to the apex: capsule long-pedicellate, arcuate or inclined, narrow-cylindrical, constricted under the orifice when empty, brown; segments entire; cilia slender and shorter; annulus composed of a triple series of cells. — Prod. 68. *Amblystegium radicale*, Bruch & Schimp. Bryol. Eur. t. 565. *H. varium*, Beauv.; Sulliv. Musc. Allegh. n. 30. *H. serpens*, var. *varium*, Muell. Syn. ii. 412, in part. *Amblystegium serpens*, var. *radicale*, Aust. Musc. Appal. *Stereodon radicalis*, Mitt. Journ. Linn. Soc. viii. 43.

HAB. Decayed trunks, roots of trees, wet ground, or shady places; very common and extremely variable.

In its numerous varieties this species seems to pass into the last. There is, however, a constant difference in its more rigid leaves, broader and cordate at base, the costa stouter and percurrent, and the areolation shorter and thick. The capsule is generally more solid, of a uniform brown color, not red at the mouth; the operculum a little longer, sharply acute and often rostellate.

121. **H. orthocladon,** Beauv. Plants in large deep somewhat loose dark green tufts; branchlets numerous, erect, 1 or 2 c.m. long or more: stem-leaves broadly ovate-cordate at base, acuminate, those of the branches narrower, open-erect, concave, entire or obscurely serrulate; costa thick, subpercurrent; cells thick, chlorophyllose, subrhomboidal; perichætial leaves erect, the inner membranous, plicate-striate, distinctly and obtusely dentate above, cuspidate by the excurrent very broad costa: capsule large, long-cylindrical, narrowed into a long collum, slightly incurved, cernuous, yellowish brown; pedicel long, flexuous, red; operculum large, highly convex, conical-apiculate; peristome of *H. serpens;* annulus simple, narrow. — Prod. 72; Sulliv. Icon. Musc. 199, t. 122. *H. varium*, Hook. & Wils., Drumm. Musc. Amer. (Coll. II.), n. 142. *H. serpens*, var. *varium*, Muell., in part. *H. serpens*, var. *orthocladon*, Aust. l. c.

Hab. Margins of swamps and springy places, on the ground, on stones, and decayed logs; very common, and very difficult to separate from the last species.

122. **H. irriguum,** Hook. & Wils. Plants drooping, cespitose; stems rigid; branches subpinnately ramulose: leaves solid, spreading and subsecund, opaque, deltoid-ovate, obcordate or decurrent at base, acuminate, subserrulate, costate to the apex; basilar areolation much enlarged: capsule oblong or strongly arcuate and contracted below the mouth when dry, pale brown; operculum as in the last species; teeth orange below, with a broad hyaline border; annulus of a triple series of cells. — Wils. Bryol. Brit. 361. *Amblystegium fluviatile*, Bruch & Schimp. Bryol. Eur. t. 566, not Swartz.

Var. **spinifolium.** Tufts greenish black; stems long, rigid, thick, immersed, flexuous, prostrate, irregularly pinnate: leaves appressed, strict, solid, narrower, sublinear, cuspidate by the very thick excurrent costa. — *H. fluviatile*, James, Proc. Acad. Phil. 1855, 447. *H. noterophilum*, Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 348; Sulliv. Mosses of U. States, 78.

Hab. Niagara Falls, Trenton Falls, and Little Falls, New Jersey; the variety in limestone springs, Pennsylvania (*Porter*).

123. **H. fluviatile,** Swartz. Tufts flat, soft, dirty green; stems with few radicles, prostrate, denudate of leaves in the lower part by maceration; branchlets few, suberect: leaves more or less remote, open, ovate or oblong-lanceolate, concave, the borders recurved at base; costa very thick, abruptly dissolved below the apex; areolation very loose, oblong-ovate, larger at the base, but uniform; perichætial leaves erect, costate: capsule long-cylindrical, arcuate, solid, yellowish brown; peristome normal. — Musc. Suec. 63. *Amblystegium fluviatile,* Bruch & Schimp. Bryol. Eur. t. 567.

HAB. On rocks, Closter, New Jersey (*Austin*); Ontario (*Mrs. Roy*).

124. **H. adnatum,** Hedw. Plants depressed, in wide flat pale green or yellowish mats; stems creeping, irregularly branching, closely ramulose; branchlets short, distichous: leaves close, erect-spreading, ovate or oblong, gradually acuminate, very concave and entire, ecostate or shortly bistriate at base; areolation pellucid, subrhomboidal, prosenchymatous, elongated at base, smaller, quadrate and opaque at the basilar angles; outer perichætial leaves ovate, narrowly acuminate, spreading, the inner larger, erect, oblong, abruptly acuminate, coarsely and irregularly dentate below the point, more distinctly costate to the middle: capsule erect, cernuous, oblong, unequal, gradually narrowed to a short pedicel, reddish above, yellowish below; operculum pale, convex-conical, more or less long-pointed; teeth yellowish; cilia one or two, nearly as long as the entire segments; annulus persistent. — Spec. Musc. 248, t. 64; Sulliv. Mosses of U. States, 78, and Icon. Musc. 197, t. 121.

HAB. Shady woods on stones or on trees near the surface of the ground; common and variable.

125. **H. compactum,** Muell. Plants small, in very compact tufts, reddish brown within, greenish on the surface; stems slender, 2 or 3 c.m. long, erect, fasciculately ramose, tomentose-radiculose to near the apex; branches closely foliate: leaves erect-spreading, ovate-lanceolate, gradually acuminate, decurrent at base, concave, serrulate on the borders especially below, thickly costate to near the apex; areolation loose, narrowly rhomboidal, fusiform, with few smaller quadrate alar cells; perichætial leaves oblong, more abruptly acuminate, distinctly serrulate at the apex, narrowly costate: capsule erect or slightly inclined, oblong, thin, constricted under the broad orifice, long-

pedicellate, narrowed to a distinct collum; operculum conical, acute or short-rostellate; teeth pale yellow; segments slightly cleft along the keel; cilia single, very short; annulus simple. — Syn. ii. 408; Sulliv. Icon. Musc. 201, t. 123. *Hypnum serpens*, var. *compactum*, Drumm. Musc. Amer. n. 188. *Stereodon compactus*, Mitt. l. c.

Hab. On decayed wood; British America (*Drummond*); Fort Colville (*Lyall*); Nevada (*Watson*); Ontario, Canada (*Macoun*).

Amblystegium serratum, Bruch & Schimp. (Bryol. Eur. *Amblystegium*, 11; Sulliv. Mosses of U. States, 78), probably belongs to this species.

126. **H. Lescurii**, Sulliv. Tufts loose, dark green or black; stems prostrate, defoliate at base, irregularly branching and ramulose; branchlets close, unequal: leaves loosely imbricate, erect-spreading, thick, opaque, serrulate all around the borders, those of the stem broadly ovate-cordate, abruptly short-acuminate, those of the branches narrower and ovate-lanceolate, all concave with a yellowish border formed of 4 or 5 rows of flexuous linear cells; costa very thick, vanishing in the apex; cells hexagonal-oblong, chlorophyllose; perichætial leaves erect, oblong-lanceolate, cuspidate by the excurrent costa, striate lengthwise: capsule oblong, cernuous or subincurved, short-necked; pedicel 1 to 3 c.m. long, reddish; lid convex-conical, apiculate; teeth golden yellow, connate at base; segments dehiscent along the keel; cilia two, stout, nearly as long as the segments; annulus large, compound. — Mosses of U. States, 79, and Icon. Musc. 203, t. 24; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 350.

Hab. On moist rocks; first found at Tallulah Falls, Georgia (*Lesquereux*); afterwards in most of the Middle States, from Maine to Pennsylvania; not common.

* * *Plants loosely cespitose: leaves soft, decurrent; areolation rhombic-hexagonal, loose at base, rectangular at the angles.*

127. **H. riparium**, Linn. Growing in wide loose soft dirty or yellowish green flat tufts; stems long, sometimes very long, creeping or floating, flaccid, with few branches, irregularly ramulose: leaves crowded or distant, generally distichous, sometimes subsecund, shortly decurrent, broadly ovate or oblong-lanceolate or sagittate, excavate at the basilar angles, more or less narrowly and long-acuminate, very entire, costate to above the middle; areolation narrowly rhomboidal, loosely quadrate at the angles, with the primordial utricles very distinct, espe-

cially at the base; outer perichætial leaves spreading from the middle, the inner longer, erect, narrowly acuminate and costate, bistriate: capsule incurved, subhorizontal, oval or cylindrical-oblong, arcuate when dry, light brown, often of two colors; operculum large, orange, conical-apiculate; peristome large; teeth dark orange; cilia two or three, appendiculate, as long as the segments, which are entire or slightly cleft; annulus compound. — Spec. Pl. 1129. *Amblystegium riparium*, Bruch & Schimp. Bryol. Eur. t. 570, 571. *Stereodon riparius*, Mitt.

Var. **abbreviatum.** Stems short: leaves small, more compact: capsule shorter.

Var. **flaccidum.** Small; stems filiform, very long; branches and branchlets flat, soft, divergent: leaves distant, sagittate-lanceolate, long-acuminate: pedicel short and capsule small.

Var. **fluitans.** Stems and branches long, soft, dirty yellow: leaves closely imbricated: rarely fertile.

Hab. Stones, decayed wood, and roots of trees, in swamps and stagnant water, especially var. *flaccidum;* borders of streams, floating in the mud, var. *fluitans*; very common on both slopes of North America.

Only the more marked American forms of this polymorphous species are given here. Its small states resemble *H. serpens*, larger it is much like *H. fluitans*, and in streams it resembles *Fontinalis biformis.*

128. **H. vacillans.** Plants intricate, closely cespitose; stems procumbent, sparingly subpinnately branching: stem-leaves more distant, two-ranked, erect-spreading, narrowly lanceolate-acuminate, those of the branches narrow, oblong-lanceolate, acute or blunt at the apex; costa stout, three-fourths of the length of the leaves; cells narrow, irregular at the apex, broadly quadrate and pellucid at the angles: capsule suberect, rugose; operculum conical, obtuse; cilia rugulose, shorter than the segments; annulus simple, narrow. — *Amblystegium vacillans*, Sulliv. Icon. Musc. Suppl. 96, t. 72.

Hab. White Mountains (*Oakes*).

Subgenus XVII. CAMPYLIUM.

Stems prostrate, with crowded ascending branches. Leaves abruptly long-acuminate from a broad ovate base, subsquarrose, scarcely costate; areolation minute, linear, flexuous. Capsule subarcuate, often of two colors; pedicel smooth. Operculum convex-conic. — *Campylium*, Mitt.

129. **H. hispidulum**, Brid. Monœcious: plants small, interlaced in dense bright green tufts, yellowish below; stems prostrate, radiculose, irregularly subpinnately ramulose; the branchlets slender, erect or expanded: leaves loose, horizontal or squarrose-reflexed, soft, round-deltoid, acuminate, decurrent at base, slightly concave, subserrulate all around; costa double, very short or none; cells of the basilar angles numerous, subquadrate, granulose; perichætial leaves whitish, oblong and long-acuminate, reflexed at the apex: capsule small, oblong, more or less incurved, with a wide orifice, yellowish brown; pedicel comparatively long (2 c.m.), pale yellow; operculum convex-conical, apiculate and curved upward; cilia appendiculate, nearly as long as the slightly cleft segments; annulus simple. — Musc. Recent. Suppl. ii. 198; Sulliv. Mosses of U. States, 77, and Icon. Musc. 193, t. 119. *H. Halleri*, var. (?), Hook. & Wils. in Drumm. Musc. Amer. (coll. II.), n. 147. *H. stellatum*, var. *hispidulum*, Brid. Bryol. Univ. ii. 603. *Campylium hispidulum*, Mitt. Journ. Linn. Soc. xii. 631.

Hab. Roots of trees and bushes, near the ground in swampy places.

130. **H. chrysophyllum**, Brid. Dicœcious: in loose intricate dirty or yellowish green tufts; stems long, slender, prostrate, flexuous, pinnately ramulose, the branchlets erect: leaves close, reflexed-squarrulose from an erect concave base, entire; costa simple, narrow, ascending to above the middle; outer perichætial leaves squarrose, the inner erect; capsule long-pedicellate, cylindrical-oblong, incurved, pale orange; cilia stout, nearly as long as the entire segments; annulus large, compound. — Musc. Recent. iii. 84, t. 2, fig. 2. *H. polymorphum*, Bruch & Schimp. Bryol. Eur. t. 583, not Hedw.; Sulliv. Mosses of U. States, 77.

Var. **tenellum**. Plants smaller: leaves less squarrose, glossy, more distant, narrower, longer and more narrowly acuminate, longer areolate. — *H. Bergenense*, Aust. Musc. Appal. n. 391.

Hab. On the ground, roots of trees, and decaying trunks; plains and mountains.

The species is very variable and some of its forms closely resemble *H. Sommerfeltii*, Myrin, which is a much smaller moss, with serrulate leaves. *H. Bergenense*, Aust., at first figured by Sullivant as a species for the Supplement of the Icones, was later considered by him as a variety of this species.

131. **H. stellatum,** Schreb. Dicœcious: plants robust, erect or prostrate, in deep loose intricate brown or yellow tufts; stem subdichotomous, fastigiate, scarcely radiculose: leaves close, squarrose, subdecurrent, flattish, very entire, glossy, marked at base with two short yellowish striæ instead of costa; areolation very narrow, enlarged and rectangular at the basal angles; perichætium short, the lower leaves recurved from the middle, the upper erect, plicate lengthwise, gradually narrowed into a long filiform point: male plant smaller and less divided than the fertile: capsule incurved, cernuous, oblong or subcylindrical, brown, sulcate and constricted under the orifice when empty; operculum highly convex-acuminate; teeth orange at base, yellowish above; segments slightly cleft; cilia two, nearly as long as the segments; annulus broad, compound. — Spicil. Fl. Lips. 92; Bryol. Eur. t. 584. *Amblystegium stellatum*, Lindb.

Var. **protensum,** Bruch & Schimp. l. c. Stem drooping, much branched and densely ramulose, in dense yellowish green tufts: leaves shorter.

Hab. Boggy prairies and swamps; rare in fruit. Found in fruit near Lancaster, Pennsylvania (*T. C. Porter*). The variety at Little Falls, New York; Canada (*Macoun*).

132. **H. polygamum,** Wils. Closely related to the last, differing in its less robust plants in shorter greenish brown tufts, the leaves less crowded and less squarrose, narrower and comparatively longer, ovate or oblong at base, gradually narrowed into a long subulate point, narrowly costate to below the point, and the areolation looser: perichætium radiculose below, the flowers fertile and bisexual, aggregated at its base. — Bryol. Brit. 365; Schimp. Coroll. 131. *Amblystegium polygamum*, Bruch & Schimp. Bryol. Eur. t. 572. *H. stellatum*, Drumm. Musc. Amer. n. 184, in part.

Hab. British America (*Drummond*); swamps around Closter, New Jersey (*Austin*); Chelsea, Massachusetts (*James*).

Subgenus XVIII. HARPIDIUM.

Plants with few branches, rootless, long, subpinnately ramulose, more or less hooked-curved. Leaves falcate-secund, filiformly acuminate, simply costate, of firm texture; areolation narrow, linear, enlarged toward the base and generally inflated

at the basal excavated angles. Capsule oblong-cylindrical, erect-cernuous, on a smooth pedicel. Operculum shortly convex-conical.

133. **H. aduncum,** Hedw. Dœcious: stem-leaves falcate-secund, broadly ovate or lanceolate, gradually long-acuminate, flexuous or half-twisted at the apex, with a thin compressed costa two-thirds of the length of the leaf; those upon the branchlets smaller, falcate, rarely spreading, soft and thin; basilar areolation hexagonal-rectangular, larger, inflated, pellucid at the decurrent angles, narrower in the middle, very long, narrow and rectangular or rhomboidal-hexangular at the apex; basilar perichætial leaves very broadly ovate, gradually larger above, ovate and oblong-lanceolate, the inner long-acuminate, narrowly costate and sulcate, all erect, thin, pale: capsule cylindrical or incurved-oblong, arcuate and sulcate when dry; operculum convex, short-apiculate; teeth brown; segments yellow, entire or cleft between the articulations; cilia two or three, subappendiculate; annulus compound, large. — Musc. Frond. iv. 62, t. 24; Schimp. Bryol. Eur. Suppl. *Hypnum*, t. 1.

Var. **intermedium.** Stems long, irregularly pinnate-ramulose: leaves abruptly short-acuminate from an ovate base or long-lanceolate, subsecund; lower branch-leaves ovate, short-acuminate, ecostate, the middle lanceolate, subfalcate, short-costate, the upper long-lanceolate, narrowly acuminate. — Schimp. l. c., t. 1, B 1–8.

Var. **Kneiffii,** Schimp. l. c. Stems long, flexuous, soft, prostrate or ascending, more divided; branches simple or unequally ramulose: leaves narrowly lanceolate, costate to the middle; basilar areolation narrower, angular, very large and hexagonal at the angles; lower perichætial leaves spreading from the middle, the upper deeply sulcate. — *Amblystegium Kneiffii*, Bruch & Schimp. Bryol. Eur. t. 573. *Stereodon Kneiffii*, Mitt.

Var. **polycarpum,** Bruch & Schimp. Stems curved downward, slender, more branched and ramulose: leaves loose, open, subfalcate, those of the apex falcate-secund, soft, green, broadly ovate or oblong, narrowed at base, narrowly lanceolate; areolation as in the var. *Kneiffii*: abundantly fruiting. — Bryol. Eur. t. 605, γ. *H. polycarpon*, Bland. *H. Kneiffii*, Schimp. Coroll. 135.

Var. **gracilescens**, Bruch & Schimp. Tufts soft, yellowish; stems slender, erect, sparingly branching, pinnately ramulose, the upper branchlets longer: leaves smaller, open, falcate or reflexed from the middle or undulate flexuous at the apex, lanceolate-acuminate from an enlarged cordate base, costate to above the middle; basilar areolation loose, rectangular-hexagonal, that of the apex long and flexuous-linear; leaves of the branchlets narrower, lanceolate-acuminate, uncinate. — Bryol. Eur. t. 604, fig. 3, 22, 23, and t. 605, *β*.

Var. **tenue**, Bruch & Schimp. Stem prostrate or ascending, very slender, pinnately or irregularly ramulose: leaves small, upon the stems open-secund and ovate-lanceolate, on the branches very narrow and falcate or flexuous, the perichætia often aggregated; like the last, but more slender and prostrate. — Bryol. Eur. t. 605, *δ*.

Var. **hamatum**. Plants very large and regularly pinnately ramulose; branchlets spreading, rigid, incurved hamate at the apex: young leaves yellowish green, shining, the old brown or blackish, all solid, long-lanceolate, acuminate, auriculate at the excavated angles; basal cells oval-rectangular, twice longer than broad, those of the auricles quadrate, the middle longer and narrowly hexagonal-rectangular, the apical very narrow, long, linear-hexagonal, diaphanous; costa stout, solid, rather broader than thick, reaching nearly to the apex, yellowish brown: flowers and fruit unknown. — *H. aduncum*, var. *hamatum* and var. *giganteum*, Bruch & Schimp. Bryol. Eur. t. 606. *H. hamifolium*, Schimp. Syn. ed. 2, 732.

Hab. Swampy ground, bogs and ditches; very variable and common, but rarely fruiting. Var. *gracilescens* in limestone springs, Pennsylvania; var. *Kneiffii*, with loose leaves (var. *laxum*, Milde), near Closter, New Jersey (*Austin*); and var. *hamatum*, in peat bogs and on the borders of lakes in Minnesota, and in swamps near Milwaukee, Wisconsin (*Lesquereux*).

134. **H. Sendtneri**, Schimp. Dicœcious: tufts deep and wide, dirty red or bright green at the surface, fuscous or black within; plants long, simple, flexuous, pinnately ramulose; branchlets involute at the apex: leaves crowded, falcate-secund, broadly ovate or oblong-lanceolate, acuminate, hooked, recurved from the middle, very concave, somewhat glossy, slightly striate when dry, and slightly decurrent and excavate at the angles; basilar cells long-rectangular, narrower toward the borders,

colored and hyaline, those of the angles thick, long, subquadrate, dark-orange; perichætium as in the preceding: capsule long, cernuous, erect at base or horizontally arched, cylindrical-oblong, constricted under the orifice and irregularly sulcate when dry; operculum convex, short-apiculate; teeth dark orange; segments narrowly cleft between the articulations; cilia 2 or 3, as long as the segments, stout, subappendiculate and punctulate; annulus large, compound, persistent. — Bryol. Eur. Suppl. *Hypnum*, t. 2, 3. *Amblystegium Sendtneri*, Lindb.

Var. **Wilsoni**, Schimp. l. c. Tufts deep, soft or irregularly drooping, dirty yellow or fuscous; plants very long (a foot or more); stems slender, simple or scarcely divided, distantly ramulose: leaves larger, filiform-acuminate, more or less arcuate or hooked; basilar angles shorter and quadrate; basilar areolation shorter. — *Amblystegium Wilsoni*, Lindb.

Hab. The variety only has been found in North America, in water, at Budd's Lake, New Jersey (*T. P. James*), as determined by Renault.

135. **H. uncinatum**, Hedw. Monœcious: tufts pale or yellowish green, erect or drooping; stems solid, distantly pinnately ramulose; branchlets attenuate-falcate at the apex: leaves long, falcate-secund or hooked, lanceolate-subulate, plicate, minutely serrulate above, thinly costate; areolation very narrow, more enlarged at base, broader and rectangular at the slightly excavate angles; perichætium very long, the outer leaves recurved from the middle, costate, the inner very long and long filiform-acuminate, sharply serrate at the apex, costate and plicate, soft: capsule cernuous, incurved or suberect, cylindrical, solid, constricted under the orifice when dry, brown-orange, darker when old; operculum orange, highly convex, conical-acuminate; teeth orange at the base, yellowish above; segments slightly cleft, and the two slender cilia as long as the teeth; annulus broad, of three rows of cells. — Musc. Frond. iv. 65, t. 45; Bryol. Eur. t. 600. *Stereodon uncinatus*, Brid.

Var. **abbreviatum**, Bruch & Schimp. l. c. Stems shorter: leaves narrower, incurved, falcate: capsule shorter-pedicellate, nearly erect, brown.

Var. **plumosum**, Schimp. Drooping, widely creeping, soft, pinnately ramulose: leaves hooked, with a long flexuous loricate or capillary distantly serrate point: capsule narrow, cylindrical, incurved. — Syn. 612.

Var. **plumulosum**, Bruch & Schimp. l. c. Very small and slender, intricately cespitose and creeping, pinnately ramulose: leaves small, with a shorter point, curved in a circle, distantly serrulate at apex: capsule short-pedicellate, small. — *H. Peckii*, Aust. in Rep. Reg. Univ. of State of N. York, xxv. 71.

Var. **gracilescens**, Bruch & Schimp. More densely cespitose; stem erect, slender, densely ramulose: leaves shorter, solid, less falcate.

Var. **subjulaceum**, Bruch & Schimp. Stem erect, with few branchlets, teretely imbricate: leaves erect-secund, scarcely uncinate, green, glossy: capsule suberect, cylindrical.

Var. **fragile**. Stems fragile, erect, subflexuous, simple or sparingly branching by innovations: leaves subhomomallous, uncinate, very concave, narrowly acuminate, gradually narrowed at base, very entire; areolation linear, fusiform; basilar cells much shorter, scarcely broader; those of the auricles subinflated. — *H. Jamesii*, Aust., Coult. Bot. Gaz. ii. 142.

Hab. On stones bordering rivulets or on shaded ground, and rarely on decayed wood; very common in alpine and subalpine regions, and very variable.

136. **H. fluitans**, Linn. Monœcious: plants in soft loose yellowish dirty red tufts, often immersed or floating; stems long, slender, with dichotomous divisions, pinnately ramulose: stem-leaves distant, flexuous, spreading, only those of the apex hooked, long-lanceolate, gradually narrowly acuminate; those of the branches and branchlets narrower, curved to one side or falcate-secund, all costate to near the apex, concave, not sulcate, minutely denticulate on the borders; areolation very narrowly rhomboidal, enlarged at the decurrent angles; perichætial leaves costate, the inner broad and long, narrowly acuminate: capsule erect at base, oblong, incurved, with a distinct collum, soft; pedicel very long and flexuous; operculum highly convex, mamillate; teeth short; segments entire; cilia one or two, thick, shorter than the segments; annulus none. — Fl. Suec. 322; Bryol. Eur. t. 602. *Amblystegium fluitans*, DeNot. Briol. Ital. 143.

Var. **submersum**, Schimp. Stems very long and very slender, with few branches and branchlets: leaves longer, very soft, flat, pale green when young, fuscous when old: capsule shorter, thicker, on a very long slender straight pedicel. — Syn. 609.

Var. **falcatum**, Bruch & Schimp. l. c. More robust and more densely ramulose: leaves larger, more crowded, falcate-secund, solid, yellowish when young, brown when old.

Var. **Jamesii**. Branches long, regularly pinnately ramulose: leaves long, very narrow; costa stout, nearly percurrent.

Hab. Ditches, open deep swamps, and peat-bogs; common. The last variety in the White Mountains (*James*).

137. **H. exannulatum**, Guembel. Stems erect or drooping, varying in length; branches and branchlets circinnate by the incurving of the leaves: leaves crowded, uncinate-secund, the upper falcate, long-lanceolate, narrowly acuminate, concave, not sulcate, minutely serrate below, nearly entire above, narrowly costate to near the apex, glossy; areolation vermicular, very narrow, larger and longer at base than in the middle; cells of the auriculate angles large and inflated, hyaline: capsule long-pedicellate, erect-incurved, cylindrical-oblong; operculum convex-conical, apiculate; peristome perfect; segments and cilia (three) as long as the teeth; annulus none. — Bryol. Eur. t. 603. *Amblystegium exannulatum*, DeNot. l. c. 142.

Hab. Marshy places; Catskill Mountains (*C. H. Peck*); rare.

Differs from *H. fluitans* in the more solid narrower and more falcate leaves, distinctly auriculate at base, the narrower areolation, and the dicœcious inflorescence.

138. **H. revolvens**, Swartz. Monœcious: tufts soft, reddish brown or nearly black; stems slender, erect-flexuous, branching, fastigiately ramulose: leaves twisted or circinnate-falcate, long sublinear-lanceolate, long filiform-acuminate, costate to above the middle or at the base only on the branchlets; areolation very narrow, vermicular, with a few elongated hyaline basilar cells; outer perichætial leaves erect, abruptly filiform-acuminate from a short ovate base, ecostate, the inner long, gradually long-acuminate, sulcate and narrowly costate to the base of the point: capsule erect at the distinctly necked base, cernuous, oblong-oval, scarcely constricted under the orifice when dry; operculum convex-conical, apiculate; cilia two, shorter than the slightly cleft segments; annulus large, of a triple row of cells. — Musc. Suec. 38, t. 7, fig. 14; Bryol. Eur. t. 601. *Amblystegium revolvens*, DeNot. l. c. 140.

Var. **intermedium**. Leaves more densely crowded, circinnate, shorter, with a shorter spirally incurved point; areolation shorter and broader.

HAB. Deep swamps of Northern Ohio (*Lesquereux*), sterile; Alaska (*Harrington*), fertile. The variety at Niagara Falls (*E. A. Rau*).

The variety is considered by Renault as *H. Cossoni*, a form of *H. vernicosum*.

139. **H. vernicosum,** Lindb. Dicœcious: widely cespitose, dirty green or yellow, fuscous within; plants long, erect, pinnately ramulose; branchlets short, spreading at right angles, involute, hooked at the apex: leaves very glossy, secund, hamate, reflexed from the middle, ovate or broadly oblong-lanceolate, acuminate, very entire, not decurrent nor auriculate at base, concave and sulcate, costate to above the middle; areolation long and narrowly vermicular, the lower basilar cells broader, reddish brown in two rows; outer perichætial leaves reflexed at the apex, the upper long, gradually acuminate, costate, deeply sulcate: capsule long-pedicellate, oblong, subarcuate, horizontal, much arcuate and constricted under the enlarged mouth when dry; operculum mamillate; peristome large, normal; annulus broad, compound. — Hartm. Skand. Fl. ed. 8, 17; Schimp. Bryol. Eur. Suppl. *Hypnum*, 4, t. 4. *H. Cossoni*, Schimp. l. c. 5, t. 5. *Amblystegium vernicosum*, Lindb. Musc. Scand. 33.

HAB. Bogs, Jordansville, New York (*Austin*); Brushhill Gap, near Easton, Pennsylvania (*James*); Pack River, British America (*Lyall*).

140. **H. lycopodioides,** Schwaegr. Dicœcious: plants large, in deep soft tufts, yellowish brown at the surface, dark brown within; stems long (15 to 20 c.m.), flexuous, erect or drooping, with few dichotomous branches and distant open branchlets, hooked at the apex: leaves large, falcate or flexuous, secund, ovate or oblong-lanceolate, long-acuminate, narrowly costate to near the apex, soft; areolation of very narrow vermicular undulate cells, the basilar only shorter and broader, the alar (in only two rows) serrate, quadrate; inner perichætial leaves long-ovate and long-acuminate, deeply sulcate, costate: capsule erect at base, cernuous or incurved, short-necked, linear-oblong; operculum highly convex, mamillate; teeth long and thick, with a broad hyaline border; segments as long as the teeth, cleft between the articulations; cilia three, long, distantly nodose at the articulations; annulus very broad, of three rows of large cells. — Suppl. i. 2. 300; Bryol. Eur. t. 613, 614. *Amblystegium lycopodioides*, DeNot. Briol. Ital. 138.

HAB. Bogs, and ditches in peat meadows.

141. **H. Watsoni,** Lesq. & James. Dicœcious: plants loosely cespitose; stems erect, pinnately ramulose; branchlets close: leaves hamate-secund, short and small, broadly ovate-oblong, concave at base, lanceolate, more or less long-acuminate, subulate, very entire, reflexed toward the apex, obscurely bicostate at the base; areolation very narrow, short-vermicular, uniform throughout the leaf; inner perichætial leaves long lanceolate-acuminate, subulate, thin and whitish, plicate lengthwise: capsule long, subcylindrical, slightly cernuous, arcuate and constricted under the orifice when dry; operculum obliquely rostrate, muticous. — Proc. Amer. Acad. xiv. 138. *H. imponens*, James, Bot. King Exp. 410.

Hab. On rocks, Bear River Cañon, Uinta Mountains, Utah (*Watson*).

Comparable to some varieties of *H. uncinatum*, and considered by Austin (Bull. Torr. Club, vii. 6) to be identical with *H. plicatile*, Mitt., *H. Heufleuri*, Juratzka, etc.

Subgenus XIX. CRATONEURUM.

Plants varying in size, with few branches, regularly pinnately ramulose; stem thick, covered by a dense felt of radicles and numerous paraphyllia. Leaves cordate-lanceolate, falcate-secund, thickly costate, densely areolate; cells linear, those of the decurrent excavate angles loose, dark, subopaque. Flowers dicœcious. Capsule long-pedicellate, large, oblong or cylindrical-oblong, erect at the neck, cernuous, arcuate when dry. Pedicel smooth.

142. **H. filicinum,** Linn. Leaves rigid, ovate-lanceolate, not sulcate; costa stout, percurrent; borders serrulate; cells of the basilar decurrent broadly excavate angles abruptly enlarged, orange-color; perichætial leaves erect, the inner scarcely plicate, serrate at the apex: capsule cylindrical-oblong; operculum convex-conical, apiculate; segments slightly cleft; cilia 3, as long as the teeth; annulus simple, narrow. — Spec. Pl. 1125; Bryol. Eur. t. 609. *Stereodon filicinus*, Mitt. *Amblystegium filicinum*, Lindb.

Var. **trichodes,** Brid. Stems prostrate: leaves smaller, more rigid, subsecund or spreading. — Musc. Recent. Suppl. iv. 177. *H. dubium*, Dicks.

Var. **gracilescens,** Brid. Very slender, prostrate or creeping, very tomentose: leaves spreading or subsecund, very small, bright green. — Bryol. Univ. ii. 531.

Var. **elatum,** Schimp. Plants in soft yellowish brown tufts; stems 10 to 15 c.m. long, slender, with few radicles and paraphyllia: leaves minute, ovate-lanceolate, spreading or subsecund.

Var. **Floridanum,** Renault. Leaves nearly entire; costa narrower, vanishing in the middle, often scarcely distinct; radicles and paraphyllia rare; cells of the basilar angles thick-walled.

HAB. Calcareous springs; not rare in limestone regions. The last variety in Florida (*Fitzgerald*).

Very variable, especially in the size and thickness of the plants. It differs from the next in its more slender habit, the leaves much smaller, more solid, not plicate, and with a thicker costa, the areolation shorter, the annulus of a simple row of cells, etc.

143. **H. commutatum,** Hedw. Tufts deep, rigid, bright or yellowish green at the surface, brown and generally covered with a calcareous deposit within; stems dichotomous-cristate and pinnately ramulose, very long, erect or prostrate: stem-leaves more distant, deeply cordate, auriculate-triangular at base, narrowly lanceolate-acuminate, plicate; upper auricles flat, denticulate, the lower excavate, entire, orange-colored; costa stout, subpercurrent; branch-leaves narrower, more crowded, all twisted at the apex when dry; areolation very narrow, long-linear, subflexuous; inner perichætial leaves long, narrowly acuminate, deeply plicate and strongly costate: capsule curved horizontally, cylindrical-oblong; operculum convex-conical, acuminate or apiculate; teeth large, orange; annulus large, compound. — Musc. Frond. iv. 68, t. 24; Bryol. Eur. t. 607. *Stereodon commutatus*, Mitt.

Var. **falcatum,** Muell. Stems stouter, neither tomentose-radiculose nor pinnately ramulose: leaves larger, more solid, ovate-oblong, less deeply cordate and less decurrent at base; areolation longer and narrower; costa more prolonged; peristome small and the annulus narrower. — Syn. ii. 423. *H. falcatum*, Brid. Musc. Recent. iii. 63, t. 1, fig. 6; Schimp. Syn. ed. 2, 743.

HAB. Wet rocks, Watkins Glen, N. York; Rocky Mountains, S. Colorado (*Rothrock*); Mono Pass (*Bolander*); the variety in Colorado.

Subgenus XX. RHYTIDIUM.

Plants robust, without radicles, irregularly pinnate-ramulose. Leaves transversely plicate, rugose, costate to the base of the point; upper areolation linear-vermicular, the lower sinuous, rectangular in the middle, minutely quadrate at the borders and angles. Flowers diœcious. Calyptra large, descending to the base of the capsule. Capsule solid. Operculum rostrate. Annulus very broad.

144. **H. rugosum,** Linn. In wide dirty yellowish or pale green tufts; stems arcuate or erect, stout: stem-leaves densely crowded, imbricate-secund or erect-spreading on the branchlets, lanceolate, narrowly acuminate from a broadly oblong base, corrugated by numerous short wrinkles, concave, reflexed on the borders, sharply serrate at the apex, glossy; inner perichætial leaves deeply sulcate, ecostate, erose, serrate at the apex: capsule oblong-cylindrical, much arched, gradually narrowed upward and constricted under the orifice when dry; pedicel smooth; teeth ferruginous; segments broadly split; cilia two, as long as the segments; annulus of a triple row of cells, remaining attached to the operculum. — Mant. i. 131; Bryol. Eur. t. 610. *H. rugulosum*, Web. & Mohr. *Hylocomium rugosum*, DeNot. Briol. Ital. 99.

Hab. Borders of woods, either dry or wet, not uncommon but generally sterile: found fertile only at Glen Eyrie, Colorado, on a sandy slope, by *T. C. Porter*.

145. **H. robustum,** Hook. Stem creeping; branches very stout, drooping, yellowish green: leaves densely imbricate, appressed, homomallous, transversely rugose-striate, distinctly plicate lengthwise below, scarious, ovate-lanceolate, long-acuminate, subserrulate toward the apex, bicostate or rarely simply costate to near the middle; borders revolute; cells very narrow, the alar scarcely different; perichætial leaves whitish, reflexed, loosely reticulate at base: capsule oblong-cylindrical, cernuous; pedicel purple; operculum conical, obtuse, mamillate. — Musc. Exot. t. 108; Schwaegr. Suppl. iii. t. 261; Muell. Syn. ii. 256. *Stereodon robustus*, Mitt. Journ. Linn. Soc. viii. 41.

Hab. Northwestern coast (*Menzies*); Oregon (*Mohr*); Fort Colville (*Lyall*); Rocky Mountains of British America (*Drummond*); Northwestern Montana (*Watson*).

Subgenus XXI. CTENIUM.

Plants large, in dense loose rigid tufts; stems erect or procumbent, strict, compressed, simple or dichotomous, closely and regularly pinnate-ramulose; branches frondiform; branchlets close. Leaves falcate-secund, sulcate. Flowers diœcious. Capsule long-pedicellate, arcuate, cylindrical-oblong. Operculum broadly conical, apiculate.

146. **H. crista-castrensis,** Linn. Tufts yellowish green; stems simple or forking by innovations, rigid, long; branchlets horizontally divergent, recurved at the apex: stem-leaves broad and incumbent at base, gradually long lanceolate-acuminate, twisted, falcate, deeply sulcate, thin, with a short double costa or none, sharply serrate from the middle upward; paraphyllia numerous, long, narrowly lanceolate; branch-leaves closer, narrower, falcate-secund, less distinctly serrate, ecostate; perichætium long-sheathing, whitish; perichætial leaves deeply sulcate, ecostate, greenish brown when ripe, dirty yellow when empty: teeth orange below, pale, serrate and subulate above; cilia three or four, thick, as long as the cleft segments; annulus simple, narrow. — Spec. Pl. 1125; Bryol. Eur. t. 599. *Stereodon crista-castrensis,* Mitt. l. c. *Ptilium crista-castrensis,* DeNot. Briol. Ital. 101.

Hab. Pine woods, on the ground and old prostrate logs; in mountain regions.

Subgenus XXII. CTENIDIUM.

Plants with few or no radicles; branches closely pinnately ramulose. Leaves circinnate-secund. Flowers diœcious. Capsule subhorizontal, short-pedicellate, thick, solid, turgid-ovate. Operculum large, convex, conical-apiculate. — *Ctenidium,* Mitt.

147. **H. molluscum,** Hedw. In wide tumescent or fastigiate soft bright or yellowish green tufts; stems procumbent or ascending, generally eradiculose: leaves crowded, circinnate-falcate downward, flexuous when dry, abruptly narrowly lanceolate-acuminate from a broadly obcordate decurrent base, sharply serrate all around; areolation very dense, narrow, minutely round-quadrate at the angles; paraphyllia ovate-lanceolate; perichætium short, 5-leaved, the inner oblong,

abruptly narrowly acuminate: vaginule short, hairy: capsule on a thick pedicel, chestnut-color; peristome dirty yellow; cilia two or three, stout, as long as the cleft segments; annulus very large. — Musc. Frond. iv. 56, t. 22; Bryol. Eur. t. 598. *Ctenidium molluscum*, Mitt.

Var. **condensatum**, Schimp. Drooping tufts densely intricate, velvety; stems shorter, more robust, less regularly pinnate: leaves broader falcate, the apical close, pectinate, hooked: capsule shorter-pedicellate. — Syn. 632.

Var. **erectum**, Schimp. l. c. Stems erect, less divided: leaves narrow.

Hab. Stones and rocks, shaded hills and woods, mostly in mountain regions.

Subgenus XXIII. HYPNUM, proper. (Pl. 6.)

Stems generally creeping, more or less regularly pinnate-ramulose. Leaves close, falcate-secund, very rarely equally spreading, ovate-lanceolate, narrowly acuminate; areolation linear, minutely quadrate at the angles; inner perichætial leaves sulcate; paraphyllia few. Capsule cylindrical-oblong; pedicel smooth; operculum large, rostrate or convex-conical.

148. **H. reptile**, Michx. Plants drooping, in wide loose tufts, pale or dirty green; stems branching, subpinnate or pinnately ramulose; branchlets erect, incurved: leaves crowded, lanceolate-acuminate from an oblong base, sharply serrate above, concave, flat or recurved on the borders; costa double, short, dirty yellow; paraphyllia few and very small, lanceolate or palmate; inner perichætial leaves long-acuminate, sulcate, bicostate, serrate at the apex: capsule suberect or slightly cernuous, cylindrical, ochraceous, curved above when dry; operculum large, yellow, narrowly rostrate from a highly convex-base; teeth subulate-acuminate, orange at base; segments cleft between the articulations; cilia shorter than the segments; annulus large, compound. — Fl. Bor.-Amer. ii. 315; Bryol. Eur. t. 587. *Leskea pallescens*, Hedw. Spec. Musc. 219, t. 55, f. 1–6. *H. pallescens*, Beauv. Prodr. 67. *Stereodon pallescens*, Lindb. Fl. Crypt. Asiæ Bor.-Orient. in Act. Soc. Sci. Fenn. x. 254.

Var. **protuberans**. Plants smaller: leaves narrower, longer acuminate, serrate all around: annulus narrow, simple. — Lindb.

l. c., as *Stereodon*. *H. protuberans*, Brid. Bryol. Univ. ii. 612. *H. pallescens*, Bruch & Schimp. Bryol. Eur. t. 586; Aust. Musc. Appal. n. 414.

HAB. Bark and trunks of trees, either decayed or living, in subalpine regions; very common and variable, but rare in the plains except northward.

149. **H. fertile,** Sendt. Tufts soft, compressed, yellowish or pale green; stems densely pinnate-ramulose, creeping: leaves long, ovate at base, subulate-acuminate, imbricate, secund, subcircinnately hooked when dry; borders reflexed toward the base, minutely serrulate at the apex; costa double, yellow and very obscure, or none; perichætium long, squarrulose below, the inner leaves long, erect, gradually acuminate, narrowly costate: capsule long-pedicellate, incurved-cernuous, oval or oblong, turgid, soft, darker colored underneath, scarcely narrowed under the orifice when dry; operculum large, highly convex, mamillate and apiculate; teeth large, ferruginous below; segments nearly entire; cilia two or three, perfect, not appendiculate; annulus large, compound. — Regensb. Denkschr. iii. 147; Bryol. Eur. t. 591.

HAB. Prostrate trunks, moist rocks, etc., in woods on hills and mountains; not common.

150. **H. hamulosum,** Bruch & Schimp. Densely cespitose, yellow or pale reddish-brown; stems slender, fragile, regularly pinnate-ramulose: leaves hamulose-secund, ovate at base, gradually narrowly lanceolate-acuminate, slightly denticulate at the apex; costa double, obsolete or none; areolation narrowly hexagonal-vermicular, with a single row of slightly enlarged cells at the angles; inner perichætial leaves ecostate: capsule incurved-cernuous, nearly horizontal, oval or oblong-cylindrical; operculum highly convex, long-apiculate; peristome as in the last, but more delicate; annulus double. — Bryol. Eur. t. 590. *Stereodon hamulosus*, Lindb. Musc. Scand. 38.

HAB. Rocky Mountains (*Drummond*).

151. **H. depressulum,** Muell. Differs from the last in its shining yellow color, the leaves more distant, imbricate-secund or homomallous, ovate-lanceolate, narrowly-acuminate, subserrulate at the apex, obsoletely bicostate, the cells elliptical, less compact, the alar enlarged-quadrate and pellucid, the capsule smaller, turgid-oval, cernuous, the lid shorter, conical-acute, not rostrate. — Regensb. Flora, lviii. 91 (1875). *H. hamulo-*

sum (?), Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. (ed. 2), n. 478.

Hab. Decayed trunks; White Mountains (*Oakes, James*).

152. **H. circinale,** Hook. Stems long, creeping, pinnately branching, flexuous; branches numerous, short and horizontal or longer and flexuous: leaves yellowish green, darker colored at base, secund, circinnate, lanceolate, long-subulate, concave below, plane and subserrate at the point, ecostate; perichætial leaves erect, more distinctly serrate: capsule oval, cernuous, subpendent, reddish brown; operculum short, conical; inner peristome yellow; cilia one or two, as long as the entire segments. — Musc. Exot. t. 107; Muell. Syn. ii. 318. *Stereodon circinalis*, Brid.

Hab. On trees, Northwest coast (*Menzies*); Vancouver Island (*Lyell*).

The author remarks that the species approaches the nearest to *H. cupressiforme*, but that it has the leaves much more incurved and the capsule drooping.

153. **H. Sequoieti,** Muell. Much resembling slender forms of *H. cupressiforme;* prostrate, the branches drooping, pale or dirty green: leaves small, circinnate-falcate, enlarged at base on one side and auricled, narrower and symmetrical on the other, oblong, gradually narrowed into a long falcate distinctly serrulate point, deeply concave, obsoletely bicostate, yellow at base, pale above; cells short, narrow, linear, the alar vesiculose, dark yellow; perichætial leaves broadly ovate, passing into a long denticulate suberect point: capsule small, oval, slightly inclined, chestnut-color; operculum short, conical; segments whitish, scarcely cleft; cilia single, as long as the segments, very slender, punctulate. — Regensb. Flora, lviii. 91 (1875). *H. circinale*, Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. (ed. 2), n. 474.

Hab. California, on trunks of *Sequoia sempervirens* (*Bolander*).

Probably a variety of the last. The characters indicated above do not appear important enough to authorize a separation, the mosses of this section, especially those of California, being extremely variable. The unequal base of the leaves, auricled on one side only, is distinctly marked in fig. 4 of Hooker's plate of *H. circinale*, representing an enlarged leaf, and the capsule is represented as more incurved than Mueller describes it; the areolation is not described or figured by Hooker, but he mentions the yellow color of the processes.

* * *Flowers dicœcious.*

154. **H. callichroum,** Brid. Dicœcious or pseudo-monœcious: tufts soft, tumid, bright green; stems slender, flexuous,

without radicles, pinnately ramulose: leaves soft, crowded, falcate-secund or subcircinnate, broadly ovate-concave at base, narrowly lanceolate, long-acuminate, very entire, ecostate or nearly so; cells very long and narrow, subflexuous, obtuse at both ends, broader and quadrangular at the excavate angles, yellow like the basilar ones: male flowers on separate plants similar to the fertile ones, occasionally in leafy radiculose gemmules in the axils of fertile plants; inner perichætial leaves long, broadly-ovate, half sheathing at base, slightly sulcate, narrowed to a straight filiform point, ecostate: capsule oblong, dark red, slightly inclined or cernuous upon a flexuous reddish pedicel; operculum large, highly convex, sharply apiculate, orange-colored; peristome perfect; cilia three, as long as the segments; annulus very large. — Bryol. Univ. ii. 631; Bryol. Eur. t. 596. *H. hamulosum*, Wils. Bryol. Brit. 396, t. 58. *Stereodon callichrous*, Brid. l. c.

Hab. Shelburne, Nova Scotia (*James*).

155. **H. imponens**, Hedw. Tufts flat, yellowish green: leaves imbricate, two-ranked on the lower side, circinnate-secund, loricate-filiform from a broadly ovate-oblong base; borders reflexed below, minutely and distantly serrulate all around or subentire, orange at base, minutely auriculate at the angles; costa obsolete, double or none; cells very narrow, linear, subflexuous, enlarged quadrate at the basilar angles; branch-leaves much narrower, hooked and convolute at the apex of the branches; paraphyllia large, palmate or lanceolate; perichætial leaves gradually narrowed to a long filiform flexuous serrulate point, ecostate: capsule long-pedicellate, suberect or slightly incurved, cylindrical, pale brown, darker with age; operculum convex, obliquely long-apiculate or subrostellate, orange at the apex; cilia single, appendiculate and punctulate, as long as the slightly cleft segments; annulus large, compound, adherent. — Spec. Musc. 290, t. 77; Bryol. Eur. t. 597. *Stereodon imponens*, Brid. l. c. 618.

Hab. Woods, on decayed trunks and shaded roots of trees; common.

156. **H. subimponens**, Lesq. Similar to the last in aspect, mode of growth, color, etc., but differing in its few dichotomous branches, the leaves narrower, glossy, lanceolate, shorter-acuminate from a slightly enlarged base, entire or very slightly serrulate at the apex, ecostate, the cells narrower, those of the

angles very few and small or none, the angles not excavate nor auriculate, the perichætial leaves larger, oblong, abruptly narrowed into a shorter filiform flexuous slightly serrulate point, neither costate nor sulcate, the operculum obtuse at the highly conical apex, the cilia two, not appendiculate, and the annulus large, simple, revoluble. — Trans. Amer. Phil. Soc. xiii. 14; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. (ed. 2), n. 475; Sulliv. Icon. Musc. Suppl. 103, t. 79. *Stereodon plumifer*, Mitten, Journ. Linn. Soc. viii. 41, t. 7.

Hab. Shaded rocks in woods; Northwest coast (*Menzies*, *Douglas*); Vancouver Island and British Columbia (*Lyall*); Bitterroot Mountains, Northern Idaho (*Watson*); California, at Oakland, the Big Tree Grove, etc. (*Bolander*).

The only difference mentioned by Mitten between *H. plumifer* and this species is in the lid, which he describes as short and subulate-rostrate. Comparison of authentic specimens shows it to be of the same form in both, more or less obtusely pointed.

157. **H. plicatile.** Fastigiately branching: leaves falcate-secund, broadly ovate-acuminate, hooked, rugulose, subplicate when dry, with borders reflexed and very entire, those of the branches serrulate at the apex; costa short; cells of the basal angles numerous, short, small, somewhat obscure, the upper short and narrow; perichætial leaves erect, the inner broadly oblong-lanceolate, subulate, entire, acuminate, plicate: capsule long-pedicellate, cylindrical, erect at base, curved in the middle; operculum conical; segments yellow, cleft between the articulations; cilia two, as long as the segments, nodulose. — *Stereodon plicatilis*, Mitten, l. c. 40.

Hab. Davis Straits (*Taylor*); Rocky Mountains of British America (*Bourgeau*); Schonberger's Cañon, Rocky Mountains, S. W. Montana (*Watson*).

Differing from all the states of *H. cupressiforme* in the strongly reflexed margins of the leaves, and in the short cells.

158. **H. cupressiforme,** Linn. Widely cespitose; tuft appressed, fastigiate or inflated in the middle, soft, pale green or yellowish brown, more or less glossy; stems branching irregularly or pinnately ramulose: leaves densely crowded, imbricate upward in two ranks, falcate in both directions, narrowly lanceolate-acuminate from an ovate or oblong base, concave, erect or slightly recurved on the borders, auriculate-concave at the decurrent angles, entire or slightly serrulate at the apex; costa double, short, obsolete; cells very narrow, vermicular,

those of the angles large, quadrate, hyaline or yellow; outer perichætial leaves spreading from the middle, the inner subclasping, abruptly narrowly acuminate, serrulate, obscurely short-bicostate: capsule erect or incurved, oblong or subcylindrical, chestnut-color, slightly constricted below the orifice when dry; operculum convex at base, with a short narrow beak; teeth ferruginous and confluent at base, pale dirty color above; segments cleft; cilia one or two, more or less perfect; annulus triple, persistent. — Spec. Pl. 1126; Hedw. Musc. Frond. iv. 59, t. 23; Bryol. Eur. t. 594, 595. *Stereodon cupressiformis*, Brid.

Var. **tectorum**, Brid. More robust; tufts intricate, round, flattened on the borders, tumescent in the middle, fuscous green; branchlets close: leaves longer-acuminate: capsule incurved, oblong. — Bryol. Univ. ii. 612.

Var. **brevisetum**, Bruch & Schimp. Densely cespitose, velvety green; branches and branchlets erect, fastigiate, subterete: leaves densely imbricate, slightly subsecund or erect, shorter, more concave, narrowly acuminate: capsule short-pedicellate, subarcuate, oblong; operculum acute.

Var. **uncinatulum**, Bruch & Schimp. Short, slender and small; branchlets uncinate at the apex: leaves shorter and narrower: capsule short-pedicellate, very small; operculum long-beaked.

Var. **filiforme**, Brid. Tufts compressed or pendent; stems very long, filiform, with few branches, often interruptedly foliate: leaves densely crowded or loose, secund and suberect or spreading equally: capsule small, the fruit rare.

Var. **mamillatum**, Brid. Tufts depressed, bright green, glossy: leaves obliquely imbricate, two-ranked, falcate-secund, tumid at base: operculum mammiform.

Var. **ericetorum**, Bruch & Schimp. Stems long and slender, in soft pale green tufts, pinnately ramulose: leaves narrower, less crowded, circinnate-falcate: capsule on a longer slender pedicel, shorter, incurved; operculum short, subulate.

Var. **elatum**, Bruch & Schimp. Robust, in wide loose tufts, variegated brown; stems erect, with few branchlets, thickly foliate: leaves larger and broader, very concave, abruptly acuminate, yellowish green: capsule erect, cylindrical, incurved under the orifice.

Var. **longirostre,** Bruch & Schimp. Loosely intricate-cespitose, drooping; stems slender, much branched and ramulose: leaves subsecund: capsule slender, erect; operculum subulate-rostrate.

Hab. Trunks, roots of trees, stones, etc.; very common in mountain regions, and very variable. Besides the more important varieties described and figured by Bruch & Schimper, as above, there are numerous more or less marked intermediate forms which render the determination of the species difficult and often uncertain.

159. **H. curvifolium,** Hedw. Plants large, intricate, cespitose, yellowish green, glossy; stems prostrate, with few branches, pinnately ramulose; branchlets short, unequal, compressed: leaves crowded, imbricate in two rows, falcate-secund sidewise, auricled-cordate at base, gradually long-acuminate, concave, slightly serrulate above, ecostate or shortly and obsoletely bicostate; cells very narrow, linear, flexuous, pale, at the base and angles shorter, broader and golden yellow; perichætial leaves whitish, numerous, erect, close, loosely areolate, the inner sheathing: capsule long-pedicellate, large, oblong, turgid, incurved-cernuous, thin, arcuate and distinctly costate when dry; operculum conical, apiculate; teeth yellow, broadly lamellate inside; segments slightly cleft; cilia two or three, nearly as long as the segments; annulus triple, revoluble. — Spec. Musc. 285, t. 75; Sulliv. Mosses of U. States, 74, and Icon. Musc. 183, t. 114. *Stereodon curvifolius*, Brid. l. c. 613.

Hab. Growing in large mats on decayed logs in shady woods; very common.

Sterile specimens of a peculiar aspect, generally considered as a variety of this species, appear to be an intermediate form between it and *H. arcuatum*, Lindb., differing from *H. curvifolium* in the base of the leaves excavate, auricled or decurrent, with very long alar cells, and the borders less generally denticulate. Renault, who has made a special study of this group, considers this form as rather a species than a variety. It abounds around Baltimore (communicated by *J. Donnell Smith, Fitzgerald*, etc.), but as yet only found sterile.

160. **H. complexum.** Widely cespitose, pinnately ramulose: leaves secund, larger at the base, ovate-lanceolate, hooked, concave, shortly bicostate; borders very entire; basal cells numerous, short, subquadrate, obscure, the upper long, narrow, slightly prominent at the upper end; perichætial leaves long, erect, oblong, subulate, the inner lanceolate, abruptly subulate, subserrate, plicate: capsule cylindrical, unequal, inclined; teeth

yellow, subulate from the middle; segments narrow; cilia two. — *Stereodon complexus*, Mitten, Journ. Linn. Soc. viii. 41.

HAB. On rocks between Fort William and Cumberland House, British America (*Richardson*).

161. **H. pratense,** Koch, Ms. Dœcious and pseudo-monœcious: tufts pale green and soft; stems without radicles, prostrate or suberect, irregularly and sparsely subpinnate, ramulose above: leaves crowded, plane and subsecund upon the stem and branches, falcate-secund on the branchlets, broadly oblong-lanceolate, subconcave, very entire, obsoletely short-bicostate; cells very narrowly rhomboidal-vermicular, large, inflated, hyaline at the concave angles; inner perichætial leaves long-lanceolate, short-acuminate, plicate: capsule oblong or turgid-ovate, incurved, cernuous, arcuate when dry; pedicel long, twisted to the left above when dry, to the right below; operculum convex-conical; annulus triple: inflorescence, peristome and annulus as in *H. callichroum.* — Bruch & Schimp. Bryol. Eur. t. 611. *H. curvifolium*, Muell. Syn. ii. 292, in part. *H. amœnum*, Drumm. Musc. Amer. n. 196, in part.

HAB. Boggy places on the ground; Carlton House (*Drummond*); Pennsylvania (*James*); New Jersey (*Lanning, Austin*).

162. **H. Bambergeri,** Schimp. Pulvinate-cespitose; plants yellowish green, tinged with brown; stems erect; branches fastigiate, simple or with short branchlets: leaves close, glossy, secund and laterally compressed on both sides of the stem, erect at base, circinnate or subflexuous at the apex, ovate-oblong, gradually lanceolate-subulate, very concave; borders erect, very entire; costa yellowish, simple or bifid, with unequal divisions; cells vermicular, somewhat long, those of the minutely auricled angles few, small, quadrate, and orange-color: fruit unknown. — Syn. 698. *Stereodon circularis*, Mitten, Journ. Linn. Soc. viii. 42. *S. Bambergeri*, Lindb.

HAB. Beechey Island and Wellington Channel (*Lyall*).

* * * *Leaves spreading or partly homomallous: flowers monœcious.*

163. **H. Haldanianum,** Grev. Tufts loose, irregular, yellowish or fuscous green; stems long, creeping, irregularly pinnate-ramulose; branchlets distant, unequal, subcompressed: stem-leaves homomallous, those of the divisions erect, spreading, ovate and broadly oblong-lanceolate, very entire; cells of the

concave angles large, quadrate; paraphyllia large; perichætial leaves spreading and erect from the middle, the inner long, filiform-apiculate, concave, not plicate: capsule erect or curved above, cylindrical, rostellate; teeth connate at base; segments slightly cleft; cilia generally solitary, shorter than the segments, sometimes none; annulus narrow. — Ann. N. Y. Lyc. Nat. Hist. i. 275, t. 23; Bryol. Eur. t. 592. *H. curvirostrum*, Brid. Bryol. Univ. ii. 482. *Stereodon Haldanei*, Lindb.

Hab. Decayed trunks and damp clayey ground in woods, in mountain regions.

164. **H. nemorosum**, Koch. Slightly more robust than the last; tufts drooping, dirty green; stems long, much divided, subpinnately ramulose, continued by long radiculose innovations: stem-leaves open, erect, those of the branchlets secund, ovate-oblong, abruptly acuminate, the upper lanceolate, all concave, reflexed on the borders below, generally ecostate, sharply serrate at the apex; paraphyllia multiform; perichætial leaves erect-spreading, the inner oblong, narrowed into a somewhat long coarsely serrate point, revolute on the borders, with one or two striæ: capsule erect at base, incurved, oblong-cylindrical, ferruginous; pedicel slender, twisted to the right above; lid turgid at base, long-conical; teeth orange at base, pale above; segments somewhat cleft; cilia two, nearly as long; annulus narrow, persistent or attached to the lid. — Brid. l. c. 422; Bryol. Eur. t. 593. *H. subrectifolium*, Sulliv. Musc. Allegh. n. 15.

Hab. Decayed wood; high mountains of North Carolina (*Sullivant, Gray, Lesquereux*).

Subgenus XXII. LIMNOBIUM.

Plants prostrate, with few radicles, irregularly branching and ramulose. Leaves generally secund, soft, broadly ovate or ovate-lanceolate, very concave, generally narrowly and unequally bicostate; perichætial leaves sulcate. Capsule incurved, cernuous, turgid-ovate or oblong. Operculum convex-conical or mamillate. Annulus large. — *Limnobium*, Bruch & Schimp.

\+ *Flowers monœcious.*

165. **H. palustre**, Huds. Tufts large, depressed, blackish or yellowish green; stems more or less long and divided, naked

when old; branchlets ascending or drooping: leaves close, open or secund, ovate or oblong-lanceolate, concave, narrowed and decurrent at base, very entire; costa simple, reaching above the middle, or double and short; alar cells few and large, quadrangular; inner perichætial leaves long-lanceolate, plicate: capsule brown-orange, arcuate and constricted under the orifice when dry; lid orange-color; teeth yellow; segments scarcely cleft; cilia two or three, a little shorter; annulus none. — Fl. Angl. 429. *H. luridum*, Hedw. Musc. Frond. iv. 99, t. 38. *Limnobium palustre*, Bruch & Schimp. Bryol. Eur. t. 574, 575. *Amblystegium palustre*, Lindb.

Var. **hamulosum.** Slender, ascending, mud-color; branchlets few: leaves shorter, hooked, secund: capsule smaller. — Bruch & Schimp. l. c., as *Limnobium*.

Hab. On stones and rocks, in shallow creeks; Vermont (*Frost*); New Jersey (*Austin*). The variety in the White Mountains (*James*); Utah (*Watson*); Rocky Mountains (*Drummond*).

Numerous, mostly alpine, forms of this very variable species are described.

166. **H. molle,** Dicks. Tufts loose, very soft, dirty green; stems 5–10 c.m. long, slender, flexuous, without radicles, with few simple branches: leaves spreading, whether dry or moist, broadly oval, narrowed and decurrent at the point of attachment, apiculate, distinctly serrate at the apex; costa bifurcate or divided, one of the divisions longer; areolation linear, fusiform, shorter at the apex, quadrate and orange at the subauriculate angles; inner perichætial leaves long, taper-pointed, serrulate at the apex, costate: capsule short-pedicelled, cernuous, incurved, turgid-oval; operculum convex, obtuse, short-papillate; segments entire; cilia one or two, a little shorter, thick; annulus broad. — Crypt. Fasc. ii. 11, t. 5. *Limnobium molle*, Bruch & Schimp. Bryol. Eur. t. 576, 577. *H. Closteri*, Austin, Musc. Appal. n. 439.

Hab. Mountain rivulets; North Carolina, New Jersey, New York, Canada, etc.

167. **H. alpestre,** Swartz. Plants more or less densely cespitose, mud-color, only the young shoots greenish; stems prostrate, eradiculose; branches close, erect, thickish, fastigiate, with few branchlets; leaves ovate or broadly oblong, obtusely acuminate, often oblique, half-twisted above, obscurely serrulate, slightly decurrent and excavate at the angles; costa long, bifuscate from the base, with one of the divisions longer and passing

the middle, or simple and ascending to near the apex, yellow; basilar cells narrower than in *H. molle*, yellowish, those of the basal angles broadly rectangular or hexagonal, orange; perichætium erect, sheathing, with few solid sulcate entire leaves: capsule incurved, cernuous, turgid, oblong, subarcuate, and constricted under the orifice when dry and empty; operculum highly convex, obtusely papillate, orange; teeth short; segments subulate; annulus large, persistent.—Musc. Frond. Suec. 63, excl. t.; Hedw. Sp. Musc. 247, t. 64. *H. molle*, Brid. Bryol. Univ. ii. 570, excl. syn. *Limnobium alpestre*, Bruch & Schimp. Bryol. Eur. t. 577.

Hab. North America, according to Austin.

168. **H. arcticum**, Sommerf. Tufts loose, rigid, dark olive green; stems slender, horny, with few simple branches, naked and rootless at base: leaves small, open, solid, round-ovate, obtusely pointed, very entire, slightly inflated on the borders, plano-concave, subcochleariform; costa distinct, ascending to below the apex, simple or bifurcate; areolation very narrow, not dilated at the angles; inner perichætial leaves long-lanceolate, costate, scarcely sulcate: capsule small, suberect or cernuous, oval, narrowed to a distinct collum, arcuate when dry; operculum mammiform; segments entire; cilia two, short; annulus double.—Wahl. Fl. Lapp. Suppl. 65, t. 2. *Limnobium arcticum*, Bruch & Schimp. Bryol. Eur. t. 578. *Stereodon arcticus*, Mitten, Journ. Linn. Soc. viii. 42.

Hab. On rocks along rivulets near Closter, New Jersey (*Austin*); Rocky Mountains (*Drummond*, *Lyall*).

169. **H. obtusifolium**, Drumm. Loosely cespitose; the branches more numerous, short and simple, thick, turgid and subclavate, or longer and slightly ramulose: leaves loosely imbricate all around when dry, half-open when moist, broadly oval, obtuse, very concave, slightly serrulate; costa simple, ascending to near the apex; areolation very narrow, not enlarged at the angles: pedicel rough, flexuous, arcuate below the large oval-oblong pendent or horizontal capsule, which is not constricted under the orifice when dry; operculum not seen; peristome as in *H. molle*.—Musc. Amer. n. 193. *H. arcticum*, var., Muell. Syn. ii. 432. *Stereodon obtusifolius*, Mitt. l. c.

Hab. Rivulets in the Rocky Mountains (*Drummond*); British Columbia (*Lyall*); Mount Dana, California, sterile (*Bolander*); Oregon, in fruit (*E. Hall*), from whose specimens the diagnosis has been completed.

170. **H. montanum,** Wils. Ms. Plants small, in wide soft tumid tufts, reddish-brown within, yellowish green above; stem slender, prostrate, mostly naked, with simple or fastigiately ramulose erect branches: leaves variously curved, oftener subfalcate-secund, concave or complicate, broadly ovate, lanceolate-acuminate above, decurrent at base, slightly serrulate all around; borders erect or reflexed; costa short and double or none; areolation narrow, fusiform, larger and oblong at the angles; inner perichætial leaves erect, narrowly short-acuminate, sulcate-striate, serrulate at the apex only: capsule oblong, erect, cernuous; pedicel slender, subarcuate above; operculum convex-conical, mamillate; teeth pale yellow, lamellate inside; cilia two, as long as the entire segments, nodose; annulus very broad. — James, Proc. Philad. Acad. 1855, 447; Sulliv. Mosses of U. States, 72, and Icon. Musc. 181, t. 113; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 306.

Hab. Moist rocky banks of rivulets; White Mountains (*Oakes, James*).

171. **H. eugyrium,** Schimp. Tufts appressed, bright yellowish green, soft; stems short, branching and ramulose: leaves close, multiform, those of the stems oblong-lanceolate and short-acuminate, distichous, those of the branches and branchlets flexuous-falcate, the upper and lower plano-concave, the lateral subcomplicate, falcate-flexuous, long-lanceolate, diversely curved, all serrulate at the apex only, marked at base by a short yellow line instead of a costa; cells very narrow, vermicular, those of the decurrent concave angles abruptly enlarged, rectangular, with thick dark orange walls; perichætium long, whitish, its outer leaves spreading and flexuous from the middle, the inner erect, strict, long-lanceolate, erose-denticulate at the apex, sulcate: capsule cernuous, ovate-oblong, turgid, yellowish brown; operculum highly convex-mammiform; teeth solid, yellow, linear, deeply articulate above; segments cleft between the articulations; cilia two or three, as long as the segments, nodose and granulose; annulus very broad, triple. — Syn. 639. *Limnobium eugyrium,* Schimp.; Bryol. Eur. t. 579. *Amblystegium eugyrium,* Lindb.

Hab. On rocks in mountain brooks, New York and New England.

* * *Flowers diœcious.*

172. **H. ochraceum,** Turner, Ms. Widely cespitose; tufts soft, yellowish or ferruginous green, ochraceous within; stems

prostrate or ascending, rootless, slightly ramulose; branches fastigiate, incurved at the apex: leaves close, multiform, and diversely curved, falcate or secund, broadly ovate or ovate-oblong, lanceolate, more or less acuminate, acute or blunt, sulcate, concave; costa simple or forking, ascending to the middle; borders entire or obscurely denticulate at the apex; areolation narrow, flexuous or vermicular, much enlarged rectangular and hyaline at the angles; perigynium long and perichætium squarrose, the perichætial leaves ecostate and not sulcate, lanceolate-acuminate, obtusely serrate at the apex: capsule cernuous from a short inflated erect collum, oval or oblong; operculum convex, mamillate; teeth short, light orange with a broad hyaline border; articulations distant; segments cleft between the articulations; cilia very slender, two or three, unequal, shorter than the segments; annulus large, triple.—Wils. Bryol. Brit. 400. *Limnobium ochraceum*, Bruch & Schimp. Bryol. Eur. t. 580. *Stereodon ochraceus*, Mitt. l. c. *Amblystegium ochraceum*, Lindb.

Hab. Mountain rivulets; Pocono, Alleghany, Catskill and White Mountains; British Columbia (*Lyall*); Davis Strait (*Taylor*).

Subgenus XXV. CALLIERGON.

Plants large, erect or procumbent, generally long and widely cespitose, with few simple branches or subpinnately ramulose, and with few radicles. Leaves large, cordate, ovate or ovate-oblong, obtuse, deeply concave, spreading or imbricate, rarely secund; areolation linear, narrow. Capsule oblong, incurved. Operculum convex-conical.

* *Stems more or less pinnately ramulose: leaves spreading or loosely imbricate.*

173. **H. cordifolium**, Hedw. Monœcious: tufts loose, soft, green, erect or drooping; stems flexuous, very long: stem-leaves cordate-ovate or broadly ovate, oblong, obtuse, long-decurrent, soft, very entire, simply costate to near the apex; cells of the borders and of the apex very narrow, looser and rhomboidal in the middle, those of the angles and base large, hexagonal-rectangular with the primordial utricle distinct; perichætium long, the leaves imbricate, acuminate, costate, the inner subclasping: capsule long-pedicellate, oblong-cylindrical, horizontal,

subincurved, arcuate when dry, soft, brown; teeth pale yellow, thin; segments entire; cilia two or three, slender, fragile; annulus none. — Musc. Frond. iv. 97, t. 37; Bryol. Eur. t. 615. *Amblystegium cordifolium*, DeNot. Briol. Ital. 136.

HAB. Prairie swamps, bogs, meadows, streams, and borders of lakes; rare in fruit.

174. **H. giganteum,** Schimp. Dicœcious: much like the last, from which it differs in its much larger size, the stem thick and densely pinnately ramulose, the leaves larger and more solid, the areolation more dense and vermicular, broader and quadrate at the angles, and the inflorescence dicœcious. — Syn. 642. *H. cordifolium*, var. *stenodyction*, Bruch & Schimp. l. c. *Amblystegium giganteum*, DeNot. l. c. 135. *Stereodon giganteus*, Mitt. l. c.

HAB. Reported from Pennsylvania (*James*); Wisconsin (*Lapham*); cedar swamps, New York (*Austin*); Canada (*Macoun*); Fort Colville (*Lyall*).

All the specimens examined are sterile, rather referable as a variety to *H. hamifolium* or *H. aduncum*. Mitten remarks that this is the moss distributed by Drummond (n. 209) as *H. cordifolium*, and that all American specimens are more slender than the European.

175. **H. sarmentosum,** Wahl. Dicœcious: tufts dense, variegated or dark purple, mixed with young green stolons; stems without radicles, long, more or less densely ramulose; branchlets unequal, acute: leaves open, loosely imbricate when dry, purple and straw-color, glossy, green only when young, elliptical, long-ovate, obtuse and cucullate at the apex, apiculate or not, concave; costa simple, vanishing below the apex; areolation very narrow and solid, abruptly enlarged, inflated and hyaline at the concave subdecurrent angles; perichætial leaves pale, narrowly costate, the inner subsheathing, obsoletely sulcate, nerved: capsule cernuous or horizontally incurved, ovate-oblong, turgid, arcuate when dry; teeth bright yellow; cilia two or three, stout, as long as the entire segments; annulus none. — Fl. Lapp. 380; Bryol. Eur. t. 616. *Amblystegium sarmentosum*, DeNot. l. c.

HAB. Peat bogs of New England (*Oakes*).

176. **H. cuspidatum,** Linn. Dicœcious: tufts loose, yellowish or dirty green; stems with few branches, pinnately ramulose, rigid and cuspidate at the apex by the convolute leaves: leaves crowded, erect, open, broadly ovate-oblong,

obtuse or subacute, deeply concave; costa double, short, obsolete; areolation very narrow, enlarged, quadrate and hyaline at the decurrent angles, concave on the upper face; perichætial leaves deeply sulcate, narrowly bicostate, gradually short-acuminate: capsule long-pedicellate, erect at base, horizontally incurved, oblong, large, reddish brown; operculum convex-conical, apiculate; teeth orange, hyaline-marginate, serrate at the apex; cilia three, stout, a little shorter than the narrowly cleft segments; annulus broad, triple, revoluble, persistent. — Spec. Pl. 1129; Bryol. Eur. t. 619. *Stereodon cuspidatus*, Brid. *Acrocladium cuspidatum*, Lindb. Musc. Scand. 39.

Hab. Swamps, wet meadows, grassy ditches; not common.

177. **H. Richardsoni.** Monœcious: cespitose, the branches irregularly pinnate, cuspidate at the apex: leaves spreading, broadly ovate, obtuse, concave; cells long and narrow, prominent at the apex, the alar loose, ventricose, pale; perichætial leaves oval, acute, nerved to the middle, imbricate: capsule long-pedicellate, cylindrical, arcuate, horizontal; peristome normal. — *Stereodon Richardsoni*, Mitt., Journ. Linn. Soc. viii. 42. *Amblystegium Richardsoni*, Lindb. Musc. Scand. 34.

Hab. British America (*Richardson*); coast of Greenland (*Inglefield*).

The author remarks that in its general appearance and yellowish brown color the species is closely similar to *H. cuspidatum*, and intermediate between it and *H. cordifolium*.

178. **H. Schreberi,** Willd. Diœcious: tufts high, pale, olive or grayish green; stems rigid, woody, dark red, branching and pinnately-ramulose; branches and branchlets obtuse at the apex: leaves close, loosely imbricate, broadly ovate, oblong, obtuse or obtusely pointed, slightly sulcate; costa double, short; borders recurved at base, incurved at the apex; areolation very narrow, solid, quadrate, orange at the base and at the decurrent excavate angles; inner perichætial leaves sheathing, erect, short-acuminate, ecostate, not plicate: capsule incurved, oblong, fuscous; pedicel purple, long, twisted above; operculum conical-apiculate, reddish; teeth long, lamellate on the inside, cristate; segments split nearly the whole length; cilia three, slightly shorter; annulus none. — Prodr. Fl. Berol. 325; Bryol. Eur. t. 620. *Stereodon Schreberi*, Mitt. l. c. *Hylocomium Schreberi*, DeNot. Briol. Ital. 92, and *H. parietinum*, Lindb.

Hab. On shaded ground, hills and mountains; common.

179. **H. Alaskanum,** Lesq. & James. Dicœcious: plants widely spreading, densely and regularly pinnate and bipinnate, pale green: leaves solid, broadly ovate, obtuse, plano-concave, obscurely bicostate, the borders remotely serrate; areolation vermicular, slightly larger toward the base; paraphyllia numerous, multifid. — Proc. Amer. Acad. xiv. 139.

HAB. On the ground; Alaska.

Comparable to *H. Schreberi*, from which it differs in its densely pinnate branches, the broader slightly serrate leaves, the dark color, etc.

* * *Plants nearly simple, subterete: leaves closely imbricate when dry: flowers dicœcious.*

180. **H. stramineum,** Dicks. Plants slender, in soft pale yellowish green tufts; stems long, slender, simple or with few branches, not ramulose: leaves erect, open, ovate-oblong, obtuse, concave, subcucullate, excavate at the decurrent angles, narrowly costate to above the middle; perichætial leaves taper-pointed, the inner serrate at the apex, very thinly costate, not plicate: capsule cernuous or horizontal from a short erect collum, oblong-cylindrical; lid convex-conical, acute; teeth short; segments slightly cleft; cilia two, very short, fragile; annulus none. — Crypt. Fasc. ii. 6, t. 1; Bryol. Eur. t. 617. *Amblystegium stramineum,* DeNot. l. c. 137.

HAB. Peat bogs; White Mountains (*Oakes*); Pocono Mountain, Pennsylvania (*Porter*).

181. **H. trifarium,** Web. & Mohr. Tufts dirty green above, dark brown within, rigid when dry; stems flexuous, drooping or erect, scarcely divided, filiform at base, gradually thicker above: leaves closely imbricate when dry, five-ranked, broadly ovate, obtuse, slightly decurrent, deeply concave; costa simple, ascending to the middle, or double and shorter; areolation very narrow, small and shorter at the angles; perichætial leaves loosely imbricate, the inner long-lanceolate, blunt or subacute, narrowly costate, sulcate: capsule small, cernuous and horizontal, oblong-cylindrical with a distinct collum; lid convex-conical, reddish; annulus of a triple row of very small cells; peristome as in the preceding. — Schwed. Reise, 177, t. 2; Bryol. Eur. t. 618. *H. stramineum,* var. *trifarium,* Schwaegr. Suppl. i. 2. 212, t. 89. *Amblystegium trifarium,* DeNot. l. c.

HAB. Peat bogs, Northern Ohio (*Lesquereux*); Lake Huron; sterile.

182. **H. turgescens,** Schimp. Cespitose, in deep soft tumescent dark yellow and greenish tufts; stems slender, erect, eradiculose, with few fastigiate julaceous branches and few short thick or long slender branchlets: leaves glossy, broadly oblong, deeply concave, subcucullate at the apex, abruptly short-apiculate; borders erect and entire, not decurrent nor excavate at the angles; costa short, bifurcate; cells narrow, short, hexagonal, vermicular in the upper part of the leaves, broader toward the base, large, rectangular and quadrate at the angles: male flowers minute. — Syn. ed. 2, 794.

Hab. Davis Straits (*Taylor*), according to Mitten (Journ. Linn. Soc. viii. 42).

183. **H. badium,** Hartm. Plants erect or prostrate, dark reddish brown below, orange-yellow above: leaves imbricate, short, solid, glossy, greenish yellow when young, gradually darker toward the base of the stems, broadly ovate, acute or acuminate, very entire and concave; costa ascending to above the middle, dissolving or bipartite at the apex; areolation thick, solid, flexuous-linear, with a few very small quadrate alar cells; perichætium long, imbricate, the leaves ovate, long-lanceolate, solid, thinly costate: capsule small, cernuous, turgid-oval, thin, on a slender pedicel, slightly constricted under the orifice when dry. — Skand. Fl. ed. 5, 332; Schimp. Syn. 649. *Amblystegium badium*, Lindb. Musc. Scand. 33.

Hab. Labrador (*J. A. Allen*), sterile.

A beautiful species, described by Schimper from specimens communicated by Hartmann. The capsules were deoperculate. It is considered by Mueller (Syn. ii. 324) to be a form of *H. revolvens*.

Subgenus XXVI. SCORPIDIUM.

Plants of great size, with fastigiate branches and few branchlets. Leaves turgid, imbricate, secund, broad-ovate, soft, subecostate; areolation very narrow. Flowers diœcious.

184. **H. scorpioides,** Linn. Tufts wide and deep, soft, dark green or reddish brown; plants flexuous, erect or prostrate; branches dichotomous or fastigiate, distantly and unequally ramulose; branches and branchlets arcuate or incurved at the apex: leaves crowded, turgid, imbricate-secund, those of the branches sometimes falcate, narrowed at base, broadly ovate, obtuse or short-pointed, concave, soft; costa simple or double

short, obsolete; areolation very narrow, a little enlarged at the base and angles; perichætial leaves sharply acuminate, deeply sulcate, with a very slender pale costa: capsule incurved, cernuous or arcuate, oblong-cylindrical, becoming much arched, plicate and constricted under the orifice when dry; lid convex-conical, acute; peristome perfect; cilia two or three, nearly as long as the slightly perforated segments; annulus very large, triple. — Spec. Pl. 1127; Bryol. Eur. t. 612. *Amblystegium scorpioides*, Lindb. l. c.

HAB. Cranberry marshes, Northern Ohio (*Lesquereux*); Canada (*Macoun*).

SUBGENUS XXVII. PLEUROZIUM.

Plants increasing by annual arcuate branches or by erect rigid innovations, fasciculate, pinnate and bipinnately ramulose. Stem-leaves larger than those of the branches and different in shape; paraphyllia numerous, large, pluripartite.

185. **H. splendens**, Hedw. Tufts loose, rigid, pale olive green; plants solid, the old ones many times arcuate; branchlets long, filiform: basilar leaves distant, small and squamiform, the upper larger, loosely imbricate, broadly oblong-ovate, narrowed into a long flexuous point, obsoletely bicostate, plano-concave, serrulate; branch-leaves smaller, oval-oblong, shorter-pointed; inner perichætial leaves narrowly acuminate, suberect or recurved at the apex: calyptra large, long-persistent: capsule turgid-ovate; operculum large, rostrate. — Spec. Musc. 262, t. 67. *H. proliferum*, Linn. Spec. Pl. 1125. *Hylocomium splendens*, Bruch & Schimp. Bryol. Eur. t. 487. *Hylocomium proliferum*, Lindb. Musc. Scand. 37.

Var. **compactum**. Stems compact, prostrate, with short branches and filiform or attenuated branchlets: stem-leaves short-pointed.

HAB. Deep pine woods, in mountains or northward; very common. The variety near Forteau, Labrador (*J. A. Allen*).

186. **H. umbratum**, Ehrh. Tufts loose, dark or blackish green, rigid; plants irregularly bipinnate; branchlets close, subfasciculate, unequal, arcuate to one side; stems fragile, covered with paraphyllia: stem-leaves long, decurrent at base, broadly obcordate, abruptly lanceolate-acuminate, with a long double costa, deeply sulcate, serrate all around, with a few

longer basilar teeth; branch-leaves broadly ovate, short-acuminate, dark green; perichætial leaves broad, spreading at the point: capsule turgid-ovate, subhorizontal, pale brown; lid conical, acute; segments nearly entire; annulus none. — Musc. Exsicc. n. 66; Hedw. Sp. Musc. 263, t. 67. *H. proliferum*, var. *umbratum*, Wahl. *Hylocomium umbratum*, Bruch & Schimp. Bryol. Eur. t. 488.

Hab. Deep pine woods on high mountains; summit of the Adirondack and Catskill Mountains (*Lesquereux*).

187. **H. Oakesii,** Sulliv. Plants in wide depressed swollen dirty green tufts; stems continuous by annual arcuate innovations, distantly pinnately ramulose; branches and branchlets compressed-foliate: stem-leaves loose, broadly ovate, open, those of the branches glossy, loosely incumbent, ovate-oblong, all concave, more or less long-acuminate (the borders recurved to near the apex), irregularly and coarsely serrate above, simply costate to the middle; paraphyllia large, bipinnately divided; perichætial leaves ecostate, sheathing to the middle, there squarrosely reflexed, narrowed to a long sharply serrate point: capsule globose-ovate, turgid, on a long slender arcuate pedicel; operculum convex-conical, short-rostrate; annulus none; peristome of the last. — Gray's Manual, 673 (1848), Mem. Amer. Acad. n. ser. iv. 173, t. 5, and Icon. Musc. 159, t. 102. *Hylocomium fimbriatum*, Bruch & Schimp. Bryol. Eur. t. 489. *Hylocomium Oakesii*, Schimp. Coroll. 139. *Hylocomium Pyrenaicum*, Lindb. l. c. 37.

Hab. White Mountains (*Oakes, James*).

188. **H. brevirostre,** Ehrh. Tufts large, swollen, somewhat rigid, pale or dark green; stems solid, arcuate, erect or drooping, irregularly or fasciculately pinnate-ramulose, covered with minute paraphyllia: stem-leaves spreading, squarrose or subsecund, broadly obcordate-ovate, abruptly and narrowly apiculate, decurrent and half-clasping at base, irregularly sulcate, narrowly bicostate, serrulate above, those of the branchlets ovate-lanceolate, all glossy; perichætial leaves half-sheathing at base, subulate-acuminate, squarrose-reflexed, serrate at the apex: capsule horizontal, on a pedicel arcuate above, turgid-ovate or oblong, sulcate when dry; operculum long-conical, acuminate or subrostrate; teeth orange; cilia subappendiculate; annulus narrow. — Musc. Exsicc. n. 85; Schwaegr. Suppl.

iii. 1., t. 225ª. *Hylocomium brevirostrum*, Bruch & Schimp. Bryol. Eur. t. 493.

HAB. Summit of the Alleghany Mountains (*Sullivant & Lesquereux*), fertile; deep ravines, Pennsylvania and New Jersey (*James, Austin*), sterile.

SUBGENUS XXVIII. HYLOCOMIUM.

Plants long, two or three times divided, distantly and irregularly pinnate-ramulose, with innovations from the apex and from the lateral branches. Leaves squarrose or spreading-secund; paraphyllia none. Capsule turgid-ovate or subglobose. — *Hylocomium*, Schimp.

189. **H. squarrosum**, Linn. In wide soft bright green tufts; stems slender, flexuous, distantly ramulose, the branchlets unequal, acute, flexuous: stem-leaves crowded, divaricately squarrose from the erect concave base, broadly ovate, narrowly lanceolate-acuminate, with a short costa or none; branch-leaves smaller, less squarrose, the terminal spreading, distantly and obscurely dentate, not sulcate; areolation dilated, reddish brown at base; perichætium squarrose, the inner leaves subulate-acuminate, serrulate at apex: capsule abruptly horizontal, turgid-ovate or subglobose, reddish-brown, inclined when dry; pedicel twisted to the right; operculum convex-conical, apiculate; segments split between the articulations; cilia three; annulus double. — Spec. Pl. 1127. *Hylocomium squarrosum*, Bruch & Schimp. Bryol. Eur. t. 492.

HAB. Grassy places and borders of woods; Alleghany Mountains near Summit Portage, Pennsylvania (*Lesquereux*); Oregon (*E. Hall*); rare, and found only sterile.

190. **H. triquetrum**, Linn. Tufts high and wide, rigid, yellowish or light green; stems woody, reddish, long, robust, erect, nearly simple or fastigiately branching, pinnately ramulose; branchlets unequal, short and rigid, or longer and flagelliform, sometimes radiculose at the apex: stem-leaves close, subsquarrose, rarely secund, deltoid-obcordate and decurrent at base, lanceolate above, sulcate, narrowly bicostate to the middle, serrate at the apex, scarious, loosely areolate at base; leaves of the branchlets narrower and gradually smaller upward; perichætium squarrose: capsule horizontal by a curve of the pedicel under its base or inclined, oblong, narrowed at the orifice when

dry; operculum convex, mamillate; teeth orange, with a broad yellow border; segments split their whole length; cilia three, very stout, as long as the segments; annulus simple. — Spec. Pl. 1124. *Hylocomium triquetrum*, Bruch and Schimp. Bryol. Eur. t. 491.

HAB. Pine woods; plains and mountains.

191. **H. Flemmingii.** Plants pale and robust; stems simple, erect, rigid, obtuse at the apex: leaves cordate at base, broadly ovate-lanceolate, obtusely acuminate, very flexuous, squarrose, subfalcate, deeply sulcate, minutely papillose at the apex, glossy, bicostate at base; areolation minute and narrowly subquadrate at the angles; borders minutely and closely serrulate above, reflexed and ciliate at base; nerves distant, narrow, reaching nearly to the middle, ciliate at base: flowers and fruit unknown. — *Hylocomium Flemmingii*, Aust. Bull. Torr. Club, v. 24.

HAB. Vancouver Island (*Macoun*, 1872).

The author says that this species is remarkable for the obtuse apex of the leaf and the minute decompound cilia on the margins and nerves at base. We have seen no specimen of this moss, which is probably a variety of *H. umbratum*.

192. **H. loreum,** Linn. Tufts drooping, loose, soft, pale olive or yellowish green; stems long, prostrate, nearly simple, with the few dichotomous branches distantly and interruptedly pinnate-ramulose; branchlets long, flexuous, attenuate at the often radiculose apex: leaves close, thin, broadly ovate and sulcate at base, narrowly long-lanceolate and acuminate, falcate, concave, serrulate at the apex, ecostate; areolation very narrow and equal to the base; leaves of the branchlets ovate, subulate, curved; inner perichætial leaves half-sheathing at base, subulate-acuminate, ecostate: calyptra twisted, often left attached to the pedicel: capsule subglobose, solid, reddish brown, sulcate when dry, abruptly horizontal on a strong flexuous pedicel twisted to the right; lid large, convex, mamillate; annulus and peristome as in *H. triquetrum*. — Spec. Pl. 1127. *Hylocomium loreum*, Bruch & Schimp. Bryol. Eur. t. 490.

HAB. Deep woods, Oregon (*Hall*); Rocky Mountains (*Drummond*); British Columbia (*Lyall*, etc.); Alaska (*Bischoff*).

Species of uncertain affinity; not clearly referable to any of the described subgenera.

193. **H. Wrightii,** Sulliv. Monœcious: plants loosely intricate, dark green or variegated with reddish yellow; stems prostrate, radiculose on the lower side, irregularly divided; branches long, loosely foliate: leaves two-ranked, complanate, ovate-oblong, blunt or acute at the apex, obscurely serrulate above, the lateral spreading with an oblique base, inflexed on one side; costa stout, ascending to above the middle; areolation rhomboidal-oval, slightly tumid on both sides; alar cells very numerous, small, transversely oblong, close; perichætial leaves few, loose, erect, costate to the middle, narrowed into a slender serrulate point: capsule small, oblong, erect or slightly cernuous, thin, narrowed to a short pedicel; operculum conical, short-rostrate; teeth pale-yellow, distantly articulate; segments cleft; cilia solitary, shorter; annulus none. — Icon. Musc. 209, t. 127. *Omalia Wrightii,* Sulliv. Mosses of U. States, 65; Sulliv. & Lesq. Musc. Bor.-Amer. Exsicc. n. 269.

Hab. Roots of trees; San Antonio, Texas (*Wright*); Santa Fe, New Mexico (*Fendler*).

A distinct species, not to be confounded with any other. In its suberect capsule and oblong semi-costate and complanate leaves it resembles the genus *Homalia,* to which it was originally referred, and the figure is still retained in the plates as representing sufficiently the characters of that genus.

194. **H. planum,** Brid. Monœcious: plants widely cespitose, stems prostrate, very long-creeping, complanate, irregularly pinnate, bright green: leaves loosely imbricate, broadly ovate, acute or shortly acuminate, concave below, constricted at base; borders erect, minutely crenulate; costa obsolete; cells long, narrow, papillose, the basilar few, quadrate, granulose, the alar three, small and vermicular, pellucid; perichætial leaves sheathing, broad at base, lanceolate-subulate, erose-denticulate above, more strongly papillose: capsule small, subcernuous, oval and horizontally inclined, constricted at the orifice, short-necked, on a very long yellow smooth pedicel; operculum turgid, conical-acuminate, orange; teeth yellow; segments solid, as long; cilia solitary, white. — Musc. Recent. Suppl. ii. 97; Schwaegr. Suppl. iii., t. 280. *Leskea* (*Omalia*) *cymbifolia,* Brid. Bryol. Univ. ii. 333.

Hab. Florida, not rare (*Austin, J. Donnell Smith*).

195. **H. Coloradense,** Aust. Plants robust; stems erect or at length prostrate, compressed, sparingly branched: leaves erect, appressed-imbricate, not changed in drying, oblong-ovate, concave, abruptly piliferous at the often recurved apex; margins entire or subserrate, scarcely recurved at the somewhat narrowed and rounded base; angles excavated; cells less narrow, nearly straight and uniform except at the very base, where they are shorter and slightly inflated, oval or roundish, but not more pellucid. — Coult. Bot. Gaz. ii. 111.

HAB. Colorado (*Miss H. J. Biddlecome*).

Differs from *Myurium Herjedalicum*, Schimp. (Syn. 696), in the compressed stem, and the leaves subplicate, somewhat rounded at base, and the margin scarcely recurved below. The reticulation of the leaf suggests a *Camptothecium*, the pilum at the apex is much as in *Eurhynchium piliferum*, while the general habit of the plant is that of *Rhynchostegium*. — (*Austin.*)

ADDITIONS, ETC.

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16. **Sphagnum laricinum,** Spruce. The last locality given under the habitat should be Gloucester County, New Jersey, instead of Pennsylvania.

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1. **Ancectangium Peckii,** Sulliv. — *Amphoridium Peckii*, Sulliv. in Regents' Rep. of Univ. of State of New York, xxii. 57 (1869).

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TRICHOSTOMUM COLORADENSE, Austin. Plants small, greenish brown; stem slender, subflexuous, ½ to 1 c.m. long: lower leaves remote, the upper close together, open-incurved, linear, convolute their whole length, acute, minutely granulose-papillose; areolation minute and obscure, subpellucid at base; borders plane, very entire, thin, subpellucid at the apex, sometimes minutely serrate; costa enlarged at base, flat, very thin, scarcely distinguishable from the lamina above the middle and vanishing much below the apex. — Coult. Bot. Gaz. ii. 90.

As remarked by Watson (Bot. Calif. ii. 367), this species is based upon specimens without fruit, and the genus therefore undeterminable. The name of the collector is also uncertain, and the specific name a misnomer, as the moss is not known from Colorado. Austin states that it was collected in Yosemite Valley by a Mr. James (probably *B. W. James*).

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CRYPHÆA INUNDATA, Nees. Stems pendulous, loosely pinnately branched; branchlets recurved at the apex: leaves distant, oblong-lanceolate, carinate, the lower ones complicate, oblique; costa stout, excurrent: capsule oval, unilateral on the stems, immersed in the long ecostate perichætial leaves: cilia of the inner peristome red, persistent, incurved at the apex, as long as the teeth. — Pflanz. Maxim. von Wied, 27; Sulliv. Mosses of U. States, 56.

HAB. Floating in water and attached to immersed branches of trees, Wabash, Fox, and Black Rivers, Illinois (*Maxim. von Wied*).

As far as can be judged from the insufficient description, this moss is referable to *Dichelyma subulatum* or *D. capillaceum*.

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1ª. **Leptodon Floridanus**, Lindb. Similar to *L. trichomitrium*, differing in the plants more robust, the leaves broader and ovate, abruptly acuminate, the cells larger and especially broader, thicker and communicating by pores, the pedicel longer, nearly parallel to the stem (not diverging from it), and the capsule half as large, ovate-cylindrical. — Krit. Gransk. Moss. Dill. 53.

Hab. Florida (*Chapman*).

Page 346, after *H. plumosum*.

58ª. **H. oxycladon**, Brid. Monœcious: stem short, prostrate, vaguely or pinnately ramose; branches simple or fasciculate, slender, acute, yellowish green and shining: stem-leaves close, narrowly lanceolate, acuminate, slightly biplicate, strict or subcurved, nearly entire; alar cells loosely quadrate, thin, granulose inside; perichætial leaves nerved, the inner narrowed into a long filiform acumen, not plicate: capsule oval, equal, on a smooth pedicel; lid conical, obtuse, erect; teeth not split open; cilia single, long and slender. — Musc. Recent. Suppl. ii. 123; Schwaegr. Suppl. iii., t. 285; Muell. Syn. ii. 360. *H. attenuatum*, Brid. Bryol. Univ. ii. 448; fide Muell.

Hab. Pennsylvania (*Muhlenberg*), etc.

Mueller compares it to *H. lutescens*. From the description it appears like *H. nitens*, especially its sterile American form.

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73ª. **H. Vaucheri**, Schimp. Densely cespitose, soft, grayish green; stem prostrate, stoloniferous, with erect fasciculate branches; branchlets long, attenuate, flagelliform: leaves close, broadly ovate-lanceolate, filiform-acuminate, concave, minutely crenulate all around, glossy; costa thin, ascending to the middle or above; perichætial leaves numerous, subsquarrose, the inner long-filiform acuminate: capsule small, cernuous, turgid-ovate or oblong, subincurved; pedicel very rough; lid rostellate; teeth and segments long, subulate; cilia 1 or 2, very slender, as long as the teeth. — Bruch & Schimp. Bryol. Eur. t. 530.

Hab. Canada (*Macoun*), sterile; according to Austin.

EXPLANATION OF THE PLATES.

NOTE. — The mosses selected for illustrating the genera are figured of the natural size; their details are more or less magnified. The sign ♂ indicates the antheridia. Plates I.–V. are the same that were used by Sullivant for the illustration of his "Mosses of the United States," the figures partly from original drawings, partly taken from the plates of Bruch & Schimper's *Bryologia Europæa*. The last plate, illustrating mainly the subgenera of *Hypnum*, is, with a single exception, made up from Schimper.

PLATE I.

Andreæa. — Plant, calyptra, capsule before dehiscence, and the same after dehiscence, of *A. rupestris*, Turn.

Sphagnum. — Plant, capsule with remains of the calyptra, the same cut lengthwise, and the operculum, of *S. cymbifolium*, Ehrh.

Archidium. — Plant, a plant enlarged, capsule with base of calyptra, and upper portion of the calyptra, of *A. Ohioense*, Schimp.

Phascum. — Plant, the same enlarged, capsule, and calyptra, of *P. cuspidatum*, Schreb.

Bruchia. — Plant, a plant enlarged, calyptra, and capsule, of *B. brevifolia*, Sulliv.

Gymnostomum. — Plant, calyptra, capsule, and operculum, of *G. rupestre*, Schwaegr.

Weisia. — Plant, capsule with calyptra and operculum, and five teeth of the peristome, of *W. viridula*, Brid.

Rhabdoweisia. — Plant, calyptra, capsule with operculum, capsule when dry, and three teeth of the peristome, of *R. fugax*, Bruch & Schimp.

Dicranodontium. — Plant, calyptra, capsule with operculum, and two 2-parted teeth of the peristome, of *D. longirostre*, Bruch & Schimp.

Dicranum. — Plant, capsule with calyptra and operculum, and two teeth of the peristome, of *D. fulvellum*, Smith.

Seligeria. — Plant, capsule with calyptra and operculum, and three teeth of the peristome, of *S. tristicha*, Bruch & Schimp.

Barbula. — Plant, calyptra, capsule with operculum, and peristome, of *B. unguiculata*, Hedw.

Ceratodon. — Plant, calyptra, capsule with operculum, same when dry, and two 2-cleft teeth of the peristome, of *C. purpureus*, Brid.

Fissidens. — Plant, calyptra, capsule with operculum, and two 2-cleft teeth of the peristome, of *F. taxifolius*, Hedw.

Campylopus. — Plant, calyptra, capsule with calyptra and operculum, and two teeth of the peristome, of *C. flexuosus*, Brid.

Leptotrichum. — Plant, calyptra, capsule with operculum, and three teeth of the peristome, of *L. tortile*, Muell.

Conomitrium. — Plant, calyptra, capsule and operculum together with the pedicel and perichætial leaves, and three teeth of the peristome, of *C. Julianum*, Mont.

Trematodon. — Plant, calyptra, capsule with operculum and apophysis, and two teeth of the peristome, of *T. longicollis*, Michx.

Plate II.

Leucobryum. — Plant, calyptra, capsule with operculum, capsule when dry, and two 2-parted teeth of the peristome, of *L. vulgare*, Hampe.

Dicranum. — Plant, calyptra, capsule with operculum, and two 2-parted teeth of the peristome, of *D. scoparium*, Hedw.

Desmatodon. — Plant, calyptra, operculum, capsule, mouth of same with peristome, and two 2-parted teeth with a portion of the annulus, of *D. plinthobius*, Sulliv. & Lesq.

Didymodon. — Plant, calyptra, operculum, capsule, and two teeth of the peristome with a portion of the annulus, of *D. rubellus*, Bruch & Schimp.

Eustichia. — Plants, a plant enlarged, male flower, an antheridium, fertile flower, and section of the leaf, of *E. Norvegica*, Brid.

Distichium. — Plant, portion of stem and leaves enlarged, calyptra, capsule with operculum, and two teeth of the peristome with a part of the annulus, of *D. capillaceum*, Bruch & Schimp.

Pottia. — Plants, capsule with calyptra and operculum, and capsule with the operculum attached only by the columella, of *P. truncata*, Fuern.

Syrrhopodon. — Plant, capsule with calyptra and operculum, operculum, and three teeth of the peristome, of *S. Floridanus*, Sulliv.

Schlotheimia. — Plant, capsule with operculum, same covered by the calyptra, lower portion of the calyptra, and part of the peristome (one tooth and two cilia), of *S. Sullivantii*, Muell.

Tetraphis. — Plant, capsule with calyptra, operculum, and entire peristome, of *T. pellucida*, Hedw.

Ptychomitrium. — Plant, calyptra, operculum, capsule with peristome and portion of the annulus, and two teeth of the peristome, of *P. incurvum*, Sulliv.

Drummondia. — Plant, calyptra, capsule with calyptra and operculum, operculum, two teeth of the peristome, and three spores, of *D. clavellata*, Hook.

Encalypta. — Plant, capsule covered by the calyptra, capsule with operculum, dry capsule, and three teeth of the peristome with a part of the annulus, of *E. rhabdocarpa*, Schwaegr.

Amphoridium (as *Zygodon*). — Plant, calyptra, capsule with operculum, and dried capsule, of *A. Lapponicum*, Schimp.

Macromitrium. — Plant, calyptra, capsule, and mouth of same with the annular peristome, of *M. Sullivantii*, Muell.

Grimmia (*Schistidium*). — Plant, calyptra, capsule with calyptra and operculum, operculum with columella, and two teeth of the peristome, of *G. apocarpa*, Hedw.

Grimmia. — Plant, capsule with calyptra, and two teeth of the peristome with part of the annulus, of *G. leucophœa*, Grev.

Racomitrium. — Plant, capsule with calyptra, operculum, and one 2-parted tooth of the peristome with a portion of the annulus, of *R. aciculare*, Brid.

Hedwigia. — Plant, calyptra, capsule with operculum, and dried capsule, of *H. ciliata*, Ehrh.

Ulota. — Plant, calyptra, operculum, capsule with calyptra, dried capsule, and portion of the peristome (two pairs of teeth and three cilia), of *U. Hutchinsiæ*, Schimp.

Plate III.

Buxbaumia. — Plant, calyptra, capsule with operculum, mouth of capsule with peristome, and operculum with part of columella, of *B. aphylla*, Linn.

Diphyscium. — Plant, calyptra, capsule, peristome, and operculum with part of columella, of *D. foliosum*, Mohr.

Atrichum. — Plant, calyptra and its point more magnified, capsule with operculum, and peristome with epiphragm, of *A. angustatum*, Bruch & Schimp.

Pogonatum. — Plant, hairy calyptra covering the capsule, capsule with operculum, peristome with epiphragm and four teeth, of *P. urnigerum*, Beauv.

Polytrichum. — Plant, hairy calyptra covering the capsule, capsule with operculum, dried capsule, and three teeth of the peristome, of *P. commune*, Linn.

Bartramia. — Plant, capsule with calyptra and operculum, dried capsule, operculum, and portion of the peristome, of *B. pomiformis*, Hedw.

Mnium. — Plant, capsule with operculum, and portion of the peristome (two teeth, three perforated segments, and five cilia), of *M. cuspidatum*, Hedw.

Conostomum. — Plant, capsule with calyptra and operculum, and peristome, of *C. boreale*, Swartz.

Meesia. — Plant, a flower (of two antheridia, two archegonia, and four paraphyses), capsule with operculum, same without operculum and dry, and two teeth and two inner segments of the peristome with a part of the annulus, of *M. longiseta*, Hedw.

Funaria. — Plant, capsule with calyptra and operculum, same with operculum only, operculum, and an entire tooth of the peristome with the bases of two broken teeth opposite to two cilia, of *F. hygrometrica*, Sibth.

Aulacomnion. — Plant, calyptra, capsule with operculum, dried capsule, and part of the peristome (two teeth, one segment split along the middle, and two cilia), of *A. heterostichum*, Bruch & Schimp.

Timmia. — Plant, calyptra attached to the pedicel, capsule with operculum, dried capsule, and one tooth of the peristome with several appendiculate divisions of the segments united by fours and a portion of the annulus, of *T. megapolitana*, Hedw.

Plate IV.

Entosthodon. — Plants, calyptra, capsule with operculum, mouth of capsule with entire peristome, and three of the teeth with part of the annulus, of *E. Drummondii*, Sulliv.

Physcomitrium. — Plant, same enlarged, calyptra, capsule, and operculum with columella, of *P. immersum*, Sulliv.

Aphanorhegma. — Plant, same enlarged, calyptra, capsule, and operculum, of *A. serratum*, Sulliv.

Tetraplodon. — Plant, calyptra with operculum, calyptra, capsule with its long apophysis, and four teeth of the peristome in pairs, of *T. australis*, Sulliv. & Lesq.

Splachnum. — Plants, calyptra (entire and tipped with the style), capsule with operculum and paraphysis, operculum, mouth of capsule with the reflexed teeth of the peristome and exserted capitate columella, and two teeth, of *S. ampullaceum*, Linn.

Coscinodon. — Plant, plant enlarged, calyptra, capsule with calyptra and operculum, same with operculum only, and two teeth of the peristome with part of the annulus, of *C. Wrightii*, Sulliv.

Dichelyma. — Plant, perichætial leaves with capsule laterally emergent, capsule with calyptra and operculum, operculum, and two teeth of the peristome with two cilia connected at the apex by cross-bars, of *D. capillaceum*, Bruch & Schimp.

Fontinalis. — Plant, calyptra, capsule with operculum, same immersed in the perichætial leaves, operculum and peristome (the inner a tessellated cone), of *F. antipyretica*, Linn.

Anacamptodon. — Plant, calyptra, capsule with operculum, dried capsule, operculum, and two entire teeth of the peristome with the base of a third reflexed and three cilia-like segments, of *A. splachnoides*, Brid.

Fabronia. — Plant, calyptra, capsule with operculum, operculum, and two teeth of the peristome, of *F. Ravenelii*, Sulliv.

Antitrichia. — Plant, calyptra, capsule with operculum, operculum, and two teeth of the peristome with three segments, of *A. curtipendula*, Brid.

Leptodon. — Plant, capsule with calyptra, capsule with operculum and pedicel and perichætial leaves, and two teeth of the peristome, of *L. Ohioensis*, Sulliv.

Bryum. — Plant, an hermaphrodite flower (of two antheridia, two archegonia, and four paraphyses), capsule with operculum, and part of the peristome (one tooth, one perforated segment, and three appendiculate cilia), of *B. bimum*, Schreb.

Pylaisia. — Plant, calyptra, capsule with operculum, and portion of the peristome (three teeth with agglutinate segments), of *P. intricata*, Bruch & Schimp.

Leucodon. — Plant, capsule with calyptra and operculum, capsule with operculum and perichætial leaves, operculum, and three of the perforated teeth of the outer peristome with the inner annular membrane, of *L. julaceus*, Sulliv.

Plate V.

Homalothecium. — Plant, capsule with calyptra and operculum, operculum, and three teeth of the outer peristome with fragments of the inner membrane and a part of the annulus, of *H. subcapillatum*, Sulliv.

Platygyrium. — Plant, capsule with calyptra and operculum, operculum, and four teeth of the peristome with as many segments and a quarter of the large annulus, of *P. repens*, Bruch & Schimp.

Cylindrothecium. — Plant, capsule with calyptra and operculum, and two teeth of the peristome with one segment, of *C. cladorrhizans*, Schimp.

Myurella. — Plant, two capsules with opercula, and two teeth of the peristome with a segment and three cilia, of *M. Careyana*, Sulliv.

Leskea. — Plant, capsule with calyptra and operculum, operculum, five entire teeth of the peristome with the bases of three broken ones and three segments, and a tooth more enlarged with a segment and part of the basilar membrane and part of the annulus, of *L. obscura*, Hedw.

Clasmatodon. — Plant, capsule with calyptra and operculum, two opercula, portion of the single peristome with part of the annulus, and vertical section through the peristome, of *C. parvulus*, Sulliv.

Cryphæa. — Plant, perichætium enclosing the capsule with its calyptra and operculum, calyptra, capsule with operculum partly removed, two teeth of the peristome with three segments and a part of the annulus, and two spores, of *C. glomerata*, Bruch & Schimp.

Pterygophyllum (as *Hookeria*). — Plant, calyptra, capsule with operculum, and two teeth of the peristome with two segments, of *P. lucens*, Brid.

Climacium. — Plant, calyptra, capsule with operculum, operculum, and two teeth and two segments of the peristome, of *C. Americanum*, Brid.

Neckera. — Plant, portion of stem with male flower and perichætium enclosing the capsule, capsule with calyptra and operculum in connection with the vaginule and paraphyses of the perichætial branch, and two teeth of the peristome with three rudimentary segments, of *N. pennata*, Hedw.

Anomodon. — Plant, capsule with calyptra and operculum, and two teeth of the peristome with the inner membrane and a part of the annulus, of *A. obtusifolius*, Bruch & Schimp.

Homalia. — Plant, calyptra, capsule with operculum, and part of the peristome (one tooth, two segments, one cilium, and part of the annulus), of *Hypnum Wrightii*, Sulliv. (which agrees with *Homalia* so far as represented).

Hypnum (*Brachythecium*). — Plant, calyptra, two capsules with opercula, and part of the peristome (one tooth, one segment, and two cilia, with part of the annulus), of *H. salebrosum*, Hoffm.

Plate VI.

Thelia. — Plant, calyptra, capsule with operculum, and three teeth of the peristome with three segments of the inner membrane, of *T. hirtella*, Sulliv. — (*Sullivant.*)

Hypnum (*Eurhynchium*). — Plant, and capsule with operculum, of *H. crassinervium*, Tayl.

Hypnum (*Plagiothecium*). — Plant, and capsule with operculum, of *H. denticulatum*, Linn.

Hypnum (*Amblystegium*). — Plant, and capsule with operculum, of *H. serpens*, Linn.

Hypnum (*Pseudoleskea*). — Plant of *H. atrovirens*, Dicks. Two segments of the inner peristome with two cilia, of *H. catenulatum*, Brid.

Pterogonium. — Plant, capsule with calyptra, and two teeth of the peristome with three segments, of *P. gracile*, Swartz.

Hypnum (*Rhynchostegium*). — Plant and capsule, with operculum, of *H. demissum*, Wils.

Hypnum (*Thuidium*). — Plant, and branch-leaf enlarged, of *H. tamariscinum*, Hedw.

Hypnum (*Thamnium*). — Plant of *H. alopecurum*, Linn.

Hypnum (*Hylocomium*). — Plant, and capsule with operculum, of *H. squarrosum*, Linn.

Hypnum, proper. — Portion of a stem of *H. callichroum*, Brid.

GLOSSARY.

Abortive; not fully developed; imperfectly formed.
Acrocarpi; mosses with the fruit terminal upon the main stem.
Acuminate; taper-pointed.
Acutate; slightly pointed.
Acute; sharply pointed, but more or less abruptly.
Adnate; joined together; congenitally adherent.
Alar (cells); those at the basal angles of a leaf.
Alate; winged.
Androgynous; with male and female flowers in the same cluster of leaves.
Annulus; the ring of cells between the base of the peristome or orifice of the capsule and the operculum.
Antheridium, (plural) *Antheridia;* clavate oblong vesicles, analogous to the anthers of flowering plants.
Apical; at or belonging to the apex.
Apiculate; with an abrupt short acute point.
Apophysate; with an apophysis.
Apophysis; an enlargement of the pedicel at the base of the capsule.
Appendiculate (cilia); with small, transverse spurs attached at intervals to the margin.
Archegonium, (plural) *Archegonia;* long-necked vesicles, analogous to the pistils of flowering plants.
Arcuate, or *arched;* bent like a bow.
Areolæ; the spaces enclosed within the cells of the leaves.
Areolation; arrangement and form of the areolæ.
Arista; a short bristly awn.
Aristate; bearing a short awn.
Articulate; marked or joined by cross-bars, joints, or articulations.
Attenuated; tapering to a slender extremity.
Auriculate; furnished with auricles or ear-like appendages at the base.
Autœcious (inflorescence); each flower, male and female, in a separate involucre or cluster of leaves.
Axil; the point of union of the upper side of a leaf with the stem.
Axillary; situated in an axil.

Barren (flower); containing antheridia only.
Beak; prolonged narrow tip of the operculum.
Bifarious; two-ranked.
Bifid; two-cleft to about the middle.
Bifurcate; forking into two branches.
Bigeminate; doubly-paired, or four together.
Bipartite; two-parted.
Bisexual; having antheridia and archegonia in the same involucre. See *Synœcious.*
Bistriate; marked with two parallel lines or striæ.

Calyptra; the hood or membranous covering of the capsule and operculum.
Campanulate; bell-shaped.
Cancellate; latticed; resembling lattice-work.
Capitate; having a globose head-like apex.
Capitulum; a small head; a close, dense cluster of leaves.
Capituliform; having the form of a small head.
Capsule; the fruit, or case bearing the spores.
Carinate; keeled.
Caulescent; having a stem.
Cauline; growing on or pertaining to the stem.
Cells, or *cellules;* the vesicles composing the substance of the leaf or the areolation.
Cernuous; nodding, with the summit somewhat inclined.

Cespitose; forming matted tufts.
Chlorophyll; the green matter in the cells of leaves.
Chlorophyllose; containing chlorophyll.
Cilium, (plural) *Cilia;* hair-like divisions between the segments of the inner peristome, or slender hairs on the borders of the leaves.
Circinate; rolled inward from the tip into a circle or spiral.
Cirrhose; with a very narrow or hair-like wavy point.
Cladocarpi; mosses having the fruit terminal on short lateral branches.
Clavate; club-shaped.
Close; appressed (of leaves).
Collum; the neck or tapering base of the capsule.
Columella; the central axis around which are placed the spores in the capsule.
Comal or *comose;* tufted at the apex.
Complanate; flattened; lying in the same plane.
Confervoid; thread-like, or diffusely filamentose, like a *Conferva.*
Confluent; blended together; coherent.
Connate; united or grown together from the first.
Connivent; directed all together toward a common centre.
Constricted; suddenly contracted in width, not at the extremity.
Contracted; narrowed or shortened.
Convolute; rolled up lengthwise.
Cordate; heart-shaped.
Coriaceous; of thick texture, like leather.
Cortex; the outer integument of stems.
Cortical; belonging to the cortex.
Costa; the medial nerve or rib of a leaf.
Crenate; having the borders cut into small obtuse teeth.
Cribrose; perforated like a sieve, with small apertures.
Crispate; curled or bent in various directions.
Cucullate; hood-shaped, rolled up like a cornet of paper; as applied to the calyptra, conical and cleft on one side.
Cultriform; like the blade of a knife.
Cuneate; wedge-shaped, with the angle downward.
Cupuliform; shaped like a dome.
Cuspidate; tapering to a stout acute point.

Deciduous; falling off easily.
Decumbent; reclined on the ground, the summit tending to rise.
Decurrent (leaves); the borders prolonged downward upon the stem.
Deflexed; bent downward.
Defluent; running downward.
Dehiscent; opening or splitting open.
Dendroid; tree-like in form or appearance.
Dentate; toothed.
Denticulate; with small teeth.
Deoperculate; applied to a capsule after its lid has fallen off.
Diaphanous; transparent or translucent.
Diaphragm; a dividing membrane or partition.
Dichotomous; two-forked.
Dimidiate; split on one side.
Dimorphous; of two forms.
Diœcious; with the male and female flowers on separate plants.
Disciform; shaped like a flat disk.
Distichous; in two opposite rows; two-ranked.
Divaricate; widely spreading and divergent.
Divided; cleft to the base.
Divisural (line); the line down the teeth of the peristome by which they split.
Dorsal; placed on the back or outer surface of the leaves.
Ducts; narrow linear cells resembling vessels, separating the cellules of the leaves of *Sphagnum.*

Ecostate; without costa.
Emarginate; notched at the summit.
Emergent (capsules); rising slightly above the perichætium.
Epiphragm; membrane covering the orifice of the capsule.
Equal (capsule); symmetrical.
Eradiculose; without rootlets.
Erose; irregularly notched, as if gnawed.
Excurrent; extending beyond the apex of the leaf.
Exserted; protruding above.

Falcate (leaves); scythe-shaped; strongly curved and more or less folded.

Fascicle ; a close cluster of leaves on a very short branch.
Fasciculate (branches); clusters of short lateral unequal branches.
Fastigiate ; having the branches of equal height, in close clusters.
Fertile (flower); with archegonia, or fruit-bearing.
Fibrils ; small fibres or filaments lining the utricles of *Sphagnum.*
Filiform ; thread-like.
Fimbriate ; fringed.
Fissile ; easily split or divided.
Fistulose ; hollow and cylindrical.
Flagelliform ; long, narrow, and flexible, like the lash of a whip.
Flavescent ; yellowish or turning yellow.
Frondiform ; like the leaves of ferns; having stem and leaves fused in one.
Frondose ; frond-bearing, or like a frond.
Fugacious ; soon falling away.
Fusiform ; spindle-shaped.

Geminate ; twin; in pairs.
Gemma, (plural) *Gemmæ ;* a bud; loose granular bodies capable of becoming plants.
Gemmule ; a small bud.
Gemmaceous ; bearing *gemmæ.*
Gemmiform ; shaped like a bud.
Geniculate ; suddenly bent at an angle.
Gibbous ; more tumid on one side than on the other.
Glaucous ; covered with a bloom or pulverulent.
Granulated ; roughish on the surface.
Granuliferous ; bearing small grains.
Granulose; resembling small grains.
Gregarious ; growing in clusters, but not matted together.
Gymnostome ; with the orifice of the capsule naked; without peristome.

Hamate ; hooked.
Hamulose ; bearing or formed into small hooks.
Hispid ; bristly; beset with stiff hairs.
Homomallous (leaves); bent or curved all to one side.
Hyaline ; transparent.
Hygroscopic; sensitive to moisture; moving when moistened or dried.
Hypogynous ; inserted at the base of the pistil.

Imbricated ; overlapping each other like tiles or shingles on a roof.
Immarginate ; without margin.
Immersed (capsule); covered over and concealed by the leaves of the perichætium.
Incumbent; leaning or resting upon.
Indehiscent ; not splitting open or dehiscent.
Inflexed ; bent inward.
Inflorescence ; the arrangement of the flowers.
Innovation ; a young shoot; a supplementary extension of the stem.
Involucral ; belonging to the involucre.
Involucre ; a whorl of leaves around a flower.
Irregular ; unsymmetric.

Julaceous ; resembling a slender glossy worm; ament-like.

Laciniæ; slender lobes or segments.
Laciniate ; cut into deep narrow segments or shreds.
Lacunose ; perforated with holes.
Lamella ; a small thin plate, or thin narrow projection.
Lamellate ; consisting of small plates or lamellæ.
Lamelliform ; like lamellæ.
Lamina ; the substance of a leaf, excepting the nerve; the terminal part of the leaf in *Fissidens.*
Lanceolate ; lance-shaped.
Latticed; see *Cancellate.*
Lid; the cover of the orifice of the capsule; the operculum.
Ligulate; strap-shaped.
Linguiform, or *Lingulate;* tongue-shaped.
Lorate; thong-shaped.

Macrospores; spores of large size, in opposition to microspores, in mosses with two kinds of spores.
Mamillate; tipped with a small nipple.
Margin (of a leaf); a border of cells of peculiar shape or color.
Medullary; pertaining to the pith of stems.
Microspores; small spores. See *Macrospores.*
Microstome ; having a small mouth or orifice.
Midrib; middle nerve of a leaf.
Mitriform; mitre-shaped; in the form of a peaked cap; conical, with somewhat narrowed orifice.

Monœcious; with male and female flowers on the same plant, but not in the same receptacle.
Mucro; an abrupt short point continuous with the costa.
Mucronate; tipped with a mucro.
Mucronulate; with a very small mucro.
Multifid; many-parted, or many times divided for a portion of the length.
Muricate; having the surface rough with short hard points.
Muticous; pointless, blunt.

Neck; see *Collum.*
Nerve; see *Midrib.*
Nodose, Nodulose; knotty.

Obconical; conical inversed. *Ob* prefixed to words usually signifies inversion.
Obovate; inverted ovate, the narrow end at the base.
Obsolete; scarcely apparent.
Operculum; see *Lid.*
Ovate; shaped like an egg.

Panduriform; fiddle-shaped.
Papillate, Papillose; covered with small nipple-shaped protuberances (*papillæ*).
Paraphyllia; small thin leaves or hair-like appendages attached to the stem.
Paraphysate; having paraphyses.
Paraphyses; minute jointed filaments, accompanying the archegonia and antheridia.
Parenchymatous; composed of broad cells applied end to end.
Parœcious; with male and female flowers placed close together.
Patent; spreading open.
Pectinate; divided or branched like a comb.
Pedicel; the stalk of the capsule.
Pedicellate; furnished with a pedicel.
Pendulous; somewhat hanging or drooping, more so than *cernuous.*
Percurrent (costa); extending through the entire length of the leaf.
Perforate; pierced with holes.
Perichætium; the involucre of the female flower; the cluster of leaves at the base of the pedicel or of the capsule, when sessile, and surrounding the vaginule.
Perigonium; involucral leaves or scales of the male flower.
Peristome; fringe of teeth, etc., at the orifice of the capsule.
Persistent; not easily or soon falling away.
Plane; flat.
Pleurocarpi; mosses having axillary flowers, and the fruit lateral upon the stems or branches.
Plicate; folded lengthwise.
Polygamous; with barren and fertile flowers variously disposed on the same plant.
Polyphyllous; many-leaved.
Primordial; earliest formed.
Processes; principal divisions of the inner peristome; segments.
Procumbent; trailing on the ground.
Proliferous; bearing young shoots from the head or cluster of flowers.
Prosenchymatous; composed of narrow cells whose ends overlap each other.
Prothallium; confervoid filaments arising from the germination of the spore, or in some mosses preceding the formation of buds by rootlets.
Pseudopodium; the false pedicel or elongation of the vaginule supporting the capsule of *Sphagnum;* also applied to the granules of *Aulacomnium.*
Pulvinate; cushioned or shaped like a pillow.
Punctate, Punctulate; marked with small opaque dots.
Punctiform; dot-like.
Pyriform; pear-shaped.

Quadrate; square.

Radicles; small rooting filaments ends of the roots or rootlets.
Radiculose; covered with radicles
Ramose; branching.
Ramulose; bearing branchlets.
Receptacle; the axis or support of a flower.
Reflexed; abruptly bent back.
Repand; wavy-margined.
Reticulate; with veins forming a net-work; mesh-like.
Retuse; with the apex not only obtuse but somewhat indented.
Rhizoma; creeping subterranean stem.
Rostellate; having a short beak.
Rostrate; with a beak.

Rosulate (leaves); in a cluster regularly arranged like a rosette.
Rugose; wrinkled.

Scabrous; rough.
Scarious, or *Scariose;* thin, dry, and membranous.
Secund; one-sided; turned to one side.
Segments; divisions or teeth of the inner peristome.
Semiterete; half-cylindrical.
Serrate; having teeth pointing upward.
Serrulate; same as the last, but with small teeth.
Seta; a bristle; name sometimes applied to the pedicel.
Setaceous; bristle-like.
Sheath, Sheathing; the base of a leaf wrapped around the stem like a sheath.
Spatulate; shaped like a spatula, narrowly and obtusely obovate and attenuate downward.
Spermatozoids; active organized bodies in the antheridia, analogous to the pollen of flowering plants.
Spinulose; thorny; beset with small spines.
Sporangium; the spore-case lining the cavity of the capsule; often applied to the whole capsule.
Spores; the small round bodies contained in the capsule, taking the place of seeds.
Squamiform; shaped like a scale.
Squarrose; spreading open widely and abruptly from the axis.
Squarrulose; slightly squarrose.
Stegocarpous; having the capsule operculate.
Stipitate; having a stipe or footstalk.
Stipules; appendages at the base of the leaves.
Stoma, (plural) *Stomata;* breathing pores, especially seen upon the capsules.
Stomatose; bearing stomata.
Striate; marked with fine parallel lines or furrows.
Striolate; diminutive of striate, having very fine striæ.
Strumose; with a struma or goitre-like unsymmetrical swelling at the base of the capsule.
Sub-; a prefix signifying in a slight degree or somewhat.
Subulate; awl-shaped.
Sulcate; longitudinally grooved.
Surculus; a leafy upright shoot from the rhizoma.
Synœcious; having antheridia and archegonia in the same receptacle.

Terete; cylindrical, sometimes tapering.
Tessellate; checkered in little squares.
Thallus; confervoid filaments in the early stage of the growth of a moss. See *Prothallium.*
Tomentose; covered with down or soft matted hairs.
Torulose; knobby, where a cylindrical body is swollen at intervals.
Trabeculate (teeth); with horizontal prominent crossbars on the inner face.
Truncate; ending abruptly, as though cut transversely.
Tubercle; a small excrescence.
Tubulose; tubular.
Tumid; swollen.
Tumescent; slightly swollen.
Turbinate; shaped like a top.
Tympaniform; drum-like, applied to a membrane stretched over the orifice of the capsule.

Umbonate; bossed; with a central projection like the boss of a shield.
Uncinate; hook-shaped.
Unequal; not symmetrical.
Unilateral; one-sided.
Urceolate; contracted at the orifice; shaped like a pitcher.
Utricles; the large colored hyaline cells of the leaves of *Sphagnum.*

Vaginate; sheathed; surrounded by a sheath (*vagina*).
Vaginule; the cellular sheath surrounding the base of the pedicel, originally the lower part of the archegonium.
Vaguely; without definite order or direction.
Vermicular; worm-shaped; thick-cylindric and curved.
Verrucose, Verruculose; beset with small projections like warts.
Verticil; a whorl.
Verticillate; whorled.
Vesiculose, or *Vesicular;* bladdery; formed of vesicles or small air-cavities.

Vessels; ducts.
Villous; covered with soft long hairs.
Virescent; greenish; turning to green.

Wavy; with the surface alternately convex and concave.
Wing; membranous expansion or basilar border of the leaf prolonged on the stem.

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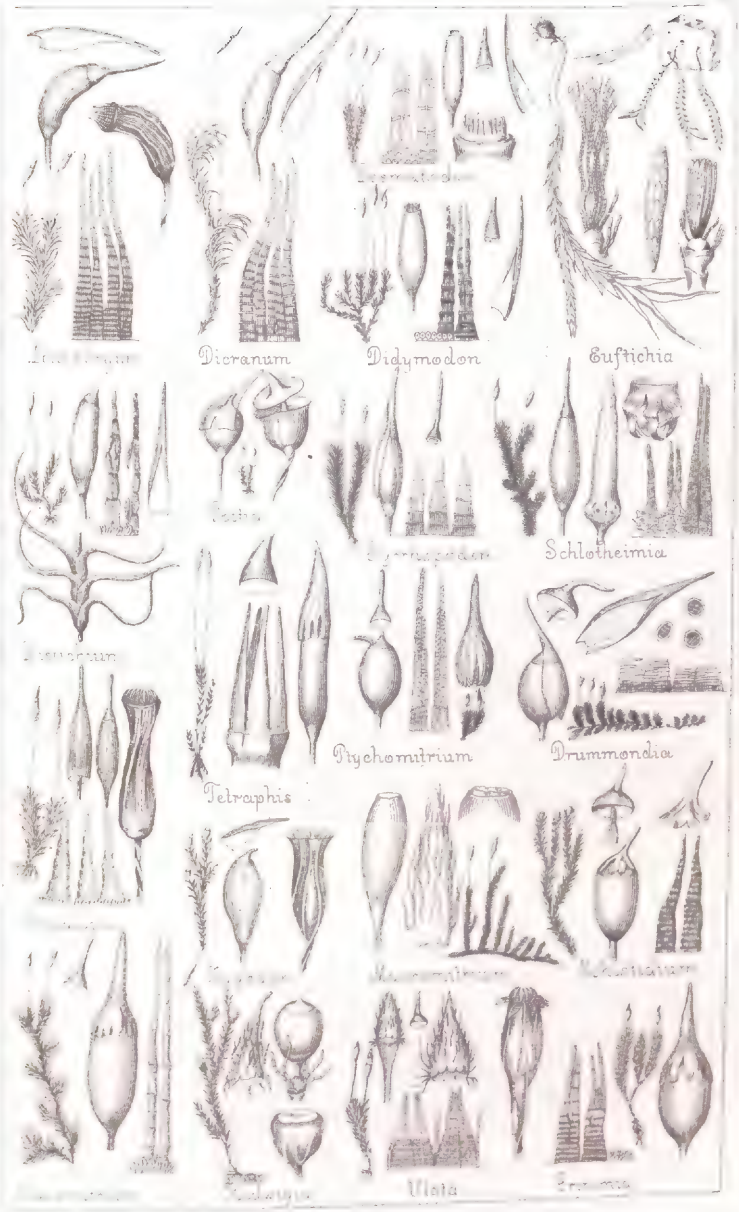
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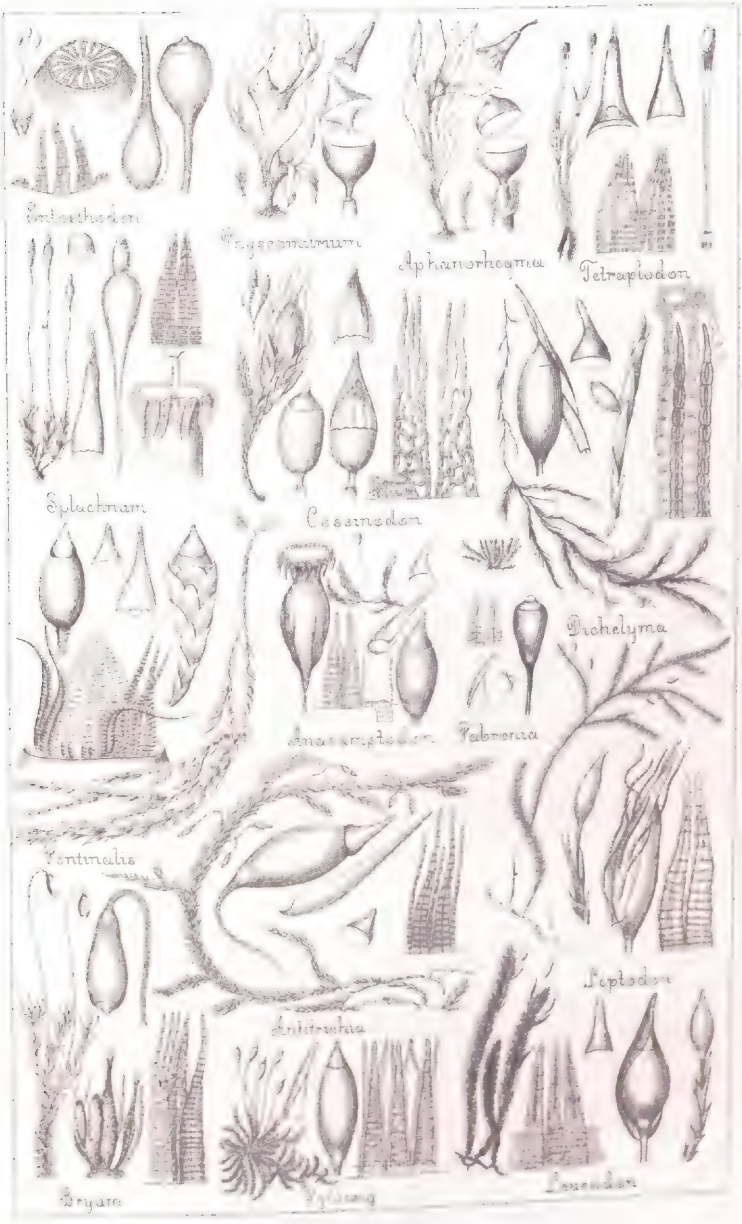
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Genera of Musci

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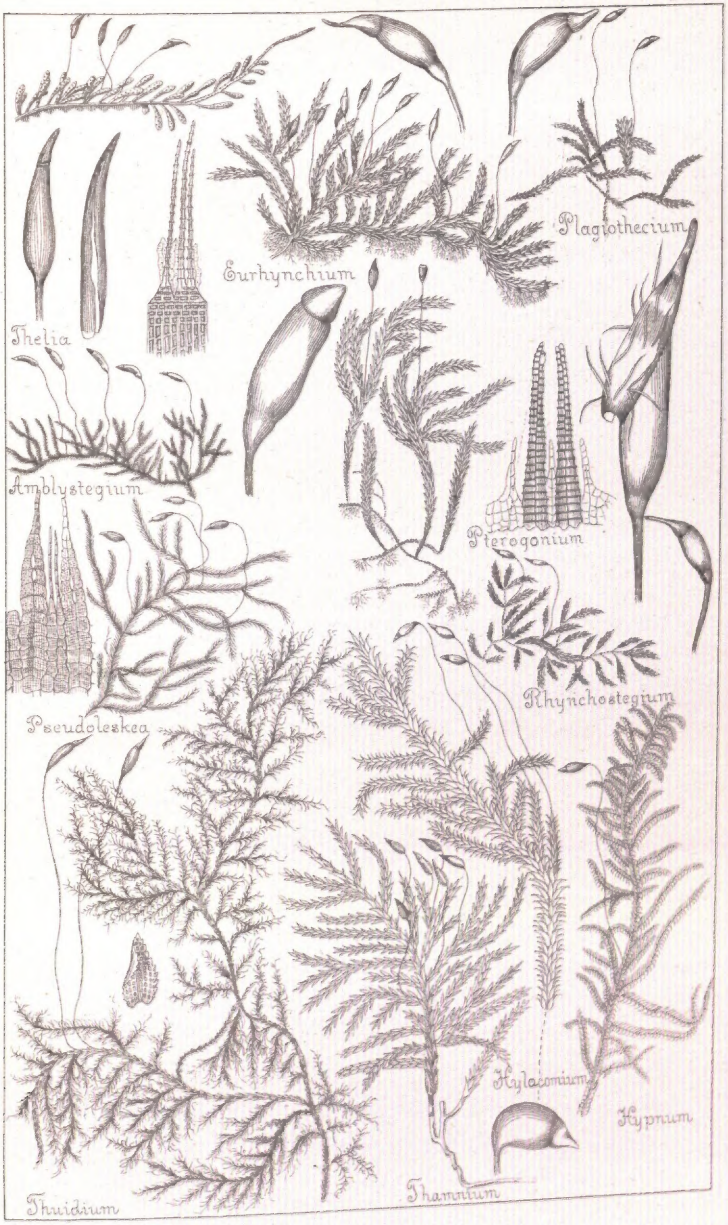
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